Concrete

Vol. 32 Chicago, February, 1928 No. 2

What About the Concrete Products Industry?

A Review of Some Developments in the Manufacture and Marketing of Concrete Building Units That Indicate Progress—Large Volume of Products Produced During Past Year—Need for Aggressive Merchandising Continues—Knowledge of Manufacturing Costs Essential—Their Relation to Selling Price — Trend is Toward Smaller Size Units

THERE is no doubt about it—the concrete products industry is growing up! A 700 per cent increase in production since 1914. And the 1927 output, based on more reliable estimates than ever before, indicates a production roughly equivalent to about 400,000,000 block of the 8- by 8- by 16-inch size. Inasmuch as a very large percentage of the units produced were of the smaller size, the actual number of units produced will probably more than double the number based on the 8- by 8- by 16-inch size.

It is usual, in reviewing past accomplishments, to judge them first according to volume of production, even though other accomplishments may be of equal or even greater importance to the welfare of the industry. During the past year there have been a number of such developments. They are evidences of progress in such fields as merchandising methods and a realization of the relation of cost of production to selling price. It is on the basis of these developments, rather than on greater output alone, that the concrete products industry can consider itself as growing into the big business class.

Merchandising

Nineteen twenty-seven is not the first year that the manufacturers of concrete products were "merchandising conscious," though that year has seen the greatest strides forward along this line. More than ever before, the concrete products manufacturer is realizing that it is as necessary to *sell* his products as it is to *make* them.

Not many years ago the principal need in the concrete products field was an improvement in the quality of the block made. The manufacturer had to learn how to make quality block at a cost that would attract buyers. As a result, a great deal of emphasis was put on operating problems. Many manufacturers have passed that stage and a few have made real progress in merchandising, though the rank and file have not yet learned how to sell aggressively and effectively. Merchandising was and still is one of the major needs of the industry.

There are many ways in which the products manufacturer can merchandise more effectively. The first is simply to *sell harder and longer*. Then, if he adds to this an intelligent use of a favorable building code as pointed out in a past issue of this journal, or actively promotes a favorable code in his community, he is doing much to pave the way for greater sales. Another effort that has a very definite effect on sales is *service* to his contractors and architects. Naturally the concrete products manufacturer knows more about concrete block and their uses than anyone else in his sales area. He can gain the good will and consideration of the contractor and architect if he will make this knowledge of his available to them in a friendly, helpful way.

Much has been done along these lines during the past year, but today the need for aggressive merchandising is as keen, if not keener, than ever before.

New Operating Problems

While most concrete products manufacturers now can make a quality block at a cost that will permit a reasonable selling price, there are new complications in marketing that have again drawn attention to operating efficiency in block plants. There is keener competition with other building materials and this often takes the form of price competition. The manufacturer in a community where this competition of industries is forcing a reduction in selling price must find means for reducing the cost of manufacturing his block so that he can meet his competitors on a price basis and still earn a reasonable profit.

These conditions are concentrating attention on costs and are arousing interest in methods of keeping cost records. A development such as this cannot help but make for more business-like administration of concrete products plants. In line with these trends, this magazine is presenting in this issue the first of a series of articles on the subject of cost accounting and its relation to better operating conditions.

Reference to another article in this issue—"How's Business?"—in which the general trends of business are analyzed, will indicate the application of these trends to the concrete products industry. The making of concrete products is not an industry that is fundamentally different from all other business enterprises. It is affected by business trends just as much as any other business. In common with all other industries, the concrete products industry is facing the problem of smaller unit profits and of more efficient plant operation. There is undoubtedly considerable opportunity to operate plants at more nearly their most economical capacity. There are also, it is reasonable to expect, possibilities for improvements in plant layout and in operating methods. All these, together with the sales problems that are a natural part of these problems must receive the earnest attention of the concrete block manufacturer if he is to come out the victor in the present-day newer competition.

Plant Consolidations

One result of the conditions mentioned above is the tendency toward consolidation. Several striking examples of this trend have been noticed during the last year or two. Medium sized plants are consolidating to gain the advantages that go with larger plants. In an address before the recent convention of the National Sand and Gravel Association, W. D. M. Allan of the Portland Cement Association said that 8 years ago there were few, if any, plants in the country producing as many as 1,000,000 block per year, whereas in 1927, 26 plants produced over a million block each.

Investment in Plant

In line with the increased interest in knowing production costs accurately has come a realization of the important part plant equipment investment and maintenance play in total manufacturing costs. It has been estimated that in some cases products manufacturers are operating their equipment at only one-seventh capacity—which, putting it another way, means that their equipment cost is seven times as great as ideal conditions would prescribe.

There is a tendency—or has been a tendency—for products manufacturers to neglect this important item in computing their costs. Here is an opportunity for economy that the new, keen price competition advises us to take advantage of. That the most progressive products manufacturers are carefully considering this phase of the manufacturing problem is another indication of the growing-up of the industry.

Lighter Units

The old 8- by 9- by 32-inch unit gave way to one of smaller size and this in turn gave way to the 8- by 8- by 16-inch block as we know it today. But the evolution toward smaller and lighter units did not stop there. It is in the field of the small unit that production is increasing more rapidly than in the larger units. The preferences of the masons seem to be a matter that is influencing this trend and these preferences cannot be ignored. Particularly the 5- by 8- by 12-inch tile is showing rapid gains.

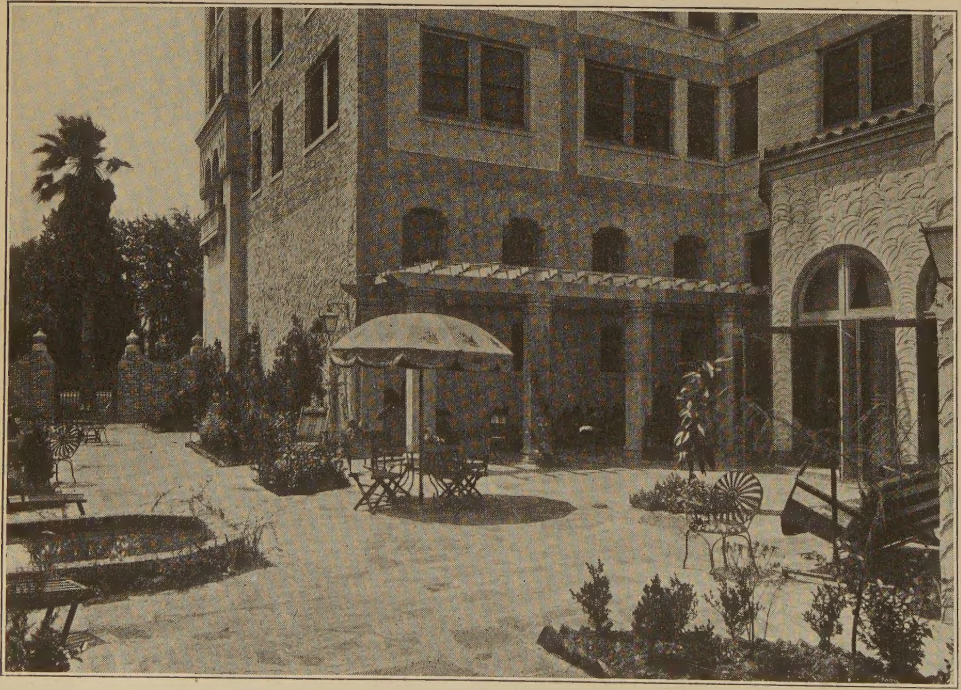
Another very important development—one that some students of the industry consider the most important in a long while—is the increasing use of light-weight aggregate for concrete masonry units. The use of these light-weight aggregates accomplishes the same result as reducing the size as far as weight is concerned and still permits the use of the 8- by 8- by 16-inch unit.

Various types of light-weight aggregates are available now. Several articles recently published in this magazine discussed the uses of these materials in concrete and indicated where they could be obtained. We can look forward to pronounced further developments in this line.

Above Grade Uses

The old problem of getting architects and builders to use concrete masonry units above grade is still with us, though some advances have been made. More and more products manufacturers are realizing that the old rock-face and panel-face block will never gain great favor. They are turning toward plain block which is to be covered with stucco as one form of the use of concrete block above grade or are realizing that plain block can be made attractive by other means.

Some manufacturers are meeting with success in making special facings that will be accepted by the building fraternity. Such facings are imitation cut stone, granite or similar treatments. Another development is the application of a color coat of some mixture of cement and



Sixty thousand 5- by 8- by 12-inch concrete masonry units were used in the construction of the Pontchartrain apartment hotel recently opened in New Orleans. The interior partition walls are of concrete block. Exterior walls are of hollow cinder tile color which is applied to the block either in the plant or on the finished wall. Several methods of applying color are available to products manufacturers and some products men have met with signal success in pushing the use of color treated block. A wider acceptance of those features in concrete block that make a direct appeal to architects and builders will be one means of increasing sales.

Summary

Last year we said that the year of 1926 has been a great year for the products industry, not so much as a year of accomplishment, but as a year of awakening. The past year has seen the beginning of the application in a practical manner of the principles of progressive business that the concrete products industry awoke to. Next year, and the years to follow, will see the benefits that result from these more business-like policies adopted by the industry. There are many problems yet confronting us. Only a beginning has been made, and the industry as a whole has not yet followed in the footsteps of its more progressive members.

Those of you who have made progress owe it to yourselves and the industry as a whole to help the slower members of the industry. Organization is the best means of accomplishing this purpose. It is only as the industry, in its broad sense, is accepted that the individual manufacturer can go to any great lengths. There is a glorious future before the concrete products industry if it will only look at its problems frankly and not let immediate selfish interests obscure its views of the needs of the entire industry.

The Work of the Concrete Products Association

By AUSTIN CRABBS

THE development of the concrete products industry has been so rapid, that even those who have been intimately associated with its growth, have hardly realized, or have not had the time to study, the needs of the industry as a whole. With the intrinsic value of the material now everywhere conceded, we face the problem of holding our own and of developing new markets against the competition of other materials, whose producers and distributors have finally awakened to the fact that in this comparatively new product, they have found a worthy and dangerous foe.

With competitive materials organized and amply capitalized for a strenuous campaign of sales promotion, there arises more and more the need for a strong national association of concrete products manufacturers, united through a realization of the fact that their interests are mutual and that an even stronger organization is required to hold and improve the position that we so far have attained, almost in spite of ourselves.

Where our problems in the past have had to do largely with production, today our chief concern is in the field of distribution, and we face a new competition that will tax our ability and ingenuity to the utmost. With this prospect before us, it becomes important for us to do what all the other major industries of the country have done, and that is, to build up a strong association that will work for the good of all and enable us to meet this organized competition. Individuals or local groups cannot cope with problems that require united action and the need for such united action is becoming more urgent day by day.

Just recently, a certain association that we had always thought should be friendly toward us, meeting in annual convention, discussed and adopted a resolution on a matter of vital interest to our industry and which, if carried out, might prove detrimental to our best interests. And the sad part of this affair is that apparently no attempt was made to understand the viewpoint and needs of the concrete products industry, nor did they consider any interests other than their own. Unless these ideas as expressed by this resolution are fair to us and fair to the general public, they cannot eventually prevail and the argument cannot be finally decided except in conformity with economic law and the best interests of all parties concerned. Through organization we can counteract the work of other associations such as this, when deliberately or unknowingly, they take any action that would harm our business and the incident mentioned above is ample evidence of the need for united action on our part.

All business is struggling today to solve the complicated problems that beset us and how complicated these are is shown by the fact that each year nearly half of the corporations reporting to the government under the income tax law, show no profit, but in many cases actual deficits. To avoid the pitfalls and hazards of modern business, the solution of the problem is being found largely through consolidation and organization and each year it is becoming harder for those who see fit to "go it alone." Through association with others in the same line of business, we not only gain a clearer understanding of the needs and problems of our industry, but through concerted action, we are able to improve our methods, increase efficiency, and even perhaps reduce prices. Our slogan should be "the most value for the least money, at a legitimate profit," and we can get this profit if we show ourselves worthy of it, through actual service to the public.

To perform this service, we need the experience and exchange of ideas obtainable only through organization and with the support and backing of a strong national association and recognizing that present-day business is competition in a higher degree than ever before, we then can go out and match our wits and resourcefulness against that of our competitors in other lines, with every confidence of success.

General Contractors Talk Over Their Problems at West Baden

Construction Conclave and Exposition Focus Attention of Builders on Many Problems—Lien Laws Come Under Fire—Accident Prevention—Relations of General Contractors and Sub-Contractors

AT the Asheville meeting of the Associated General Contractors last year, it was evident that the organization had found itself and realized the importance of the work before it.

This fact was still further emphasized during the meeting just closed when, with a record attendance, the ninth annual meeting of this organization got under way at West Baden Springs, Indiana. Throughout the sessions, which lasted from January 23rd through January 27th, these builders of America met and talked through their problems.

The program was so arranged as to encourage every opportunity for intimate detailed discussion. The meeting itself offered an innovation by outlawing set addresses to a great degree. It took the form of an open forum for the expression of opinions rather than a "program."

With such a spirit behind the meeting it is not to be wondered that great headway was made in even such a knotty problem as the state lien laws, which are arousing so much discussion now. The new, proposed draft of the Uniform Mechanics' Lien Act, sponsored by the Department of Commerce, came in for a great deal of discussion. The opinion seemed to be that parts of the Act, especially Sections 5 and 6, were distinctly unfair to the contractors and that they should be protested.

An outstanding feature of the convention was found in the discussions of mutual problems facing general contractors, sub-contractors and manufacturers. In this respect a rather striking change was instituted. This year one entire session was set aside for a frank discussion of these common problems during which there were addresses by a sub-contractor and a general contractor in which views were presented that will go a long way toward ironing out the traditional, though unnecessary, quarrel between the general contractor and the sub-contractor.

Accident prevention was another of the high lights of the convention. This important subject occupied its share of the program and everyone visiting the West Baden Hotel could see the prominence that was accorded the prevention of accidents because of the prominent displays of safety posters and safety trophies.

About a year ago the General Contractors inaugurated an accident prevention campaign. The movement has grown with surprising rapidity and throughout the country the beneficial effects of the work are felt. Several trophies, donated by various members of the organization, are offered to contractors showing the most favorable accident prevention records. Much educational work is being done to encourage the men on the job to prevent accidents.

Another interesting departure from previous meetings was the fact that the National Construction Exhibition was held in conjunction with the annual meeting of the Associated General Contractors. The exposition was held in the great circular atrium of the West Baden Springs Hotel, a fitting and convenient setting for the wide range of contractors' equipment and building materials displayed.

Headquarters for both the exposition and the meeting were at the West Baden Springs Hotel where most of the convention sessions were held.

Famous British Road Fails; to Be Reinforced with Concrete

The condition of a new arterial road between London and Southend was brought to light at a meeting to consider the reinforcement of the road. Failure to use concrete has resulted in the road not proving strong enough to resist the heavy traffic to which it is subjected. The British Ministry of Transport has therefore agreed to spend approximately £300,000 ($1,500,000) in strengthening the surface and replacing the curbing on condition that the county council carry out the necessary repairs by March 31, 1930.

The road is twenty-one miles long and was completed three years ago at a cost of £1,250,000 ($6,250,000). It was declared at the time of its inauguration that this road was a stronger road than the Romans ever built, and that even if it had to bear heavy motor traffic it was expected to last until 1932 without any repairs being necessary.

"The road was started immediately after the war to provide work for the unemployed," said Frank Dent, chairman of Essex County Council Highways Committee, in an interview. "In those days it was not realized how heavy road traffic was going to become, and roads were not built as strongly as they are today. We were always doubtful whether this road would bear the traffic. At the time of construction we urged the Transport ministry to put granite at the sides, then we said we would prefer concrete, but the Ministry said it was satisfied with timber and we were forced to leave it at that. Of course, road transport has increased tremendously since then."

The crown of the road is withstanding the strain, but the sides are spreading, and in many places there are depressions which, if left, will become pot-holes. The road is on a clay bank and it has been feared that it might give way at the sides.

Cinder Products Manufacturers Meet at Philadelphia

Manufacturers of cinders concrete products will gather at the Benjamin Franklin Hotel, Philadelphia, Pennsylvania, on March 1st to 3rd, inclusive.

This will be the fifth annual convention of the National Cinder Concrete Products Association.

Form Details on a Monolithic Concrete Building

Monolithic Concrete Walls Require Careful Form Work—Methods Used to Obtain Attractive Bush-Hammered Exterior Concrete Surface—Economical Scaffolding Designed—Form Details That Secured True Concrete Surfaces—Preventing the Surface Irregularities Caused When Concrete Shrinks from the Forms—Construction Methods—Working Drawings of Form Details

By **NELSON L. PROTHEROE**

THE new Lincoln Building, another boys' dormitory recently added to the large group of buildings making up the Stratton Home at Colorado Springs, Colorado, bids fair to answer the requirements set forth by the board of trustees, those requirements being a strong desire for a high class building with a low potential cost of upkeep.

Designed by the architect to conform with the other buildings in their Spanish design, the new Lincoln Building was built of reinforced concrete, bush-hammered, and trimmed with cut stone.

Past experience in the cost of upkeep on other buildings led the trustees of Stratton Home to consider the use of bush-hammered concrete walls. Some fears were expressed that a monolithic concrete building would lack the general characteristics of the straight line as used in other buildings in the group. But these fears were not sustained because the careful form work used secured true surfaces and straight, sharp building lines. The form details used and the methods for bracing the forms so as to secure the desired results are described in this article.

Exterior Treatment

The outer surfaces of all exterior walls, dormers and gables, and all exposed surfaces of porch walls and columns were bush-hammered. Syntron hammers with specially designed hammer heads were used.

Owing to the inadvisability of bush-hammering as soon as forms could be stripped from their areas, the finishing was not begun until after the entire building was poured. It was thought that subsequent pourings of concrete above freshly stripped surfaces, with bush-hammering begun there, would prove disastrous to the finishing. It is hard to control splashing and down trickle of concrete water.

Scaffolding

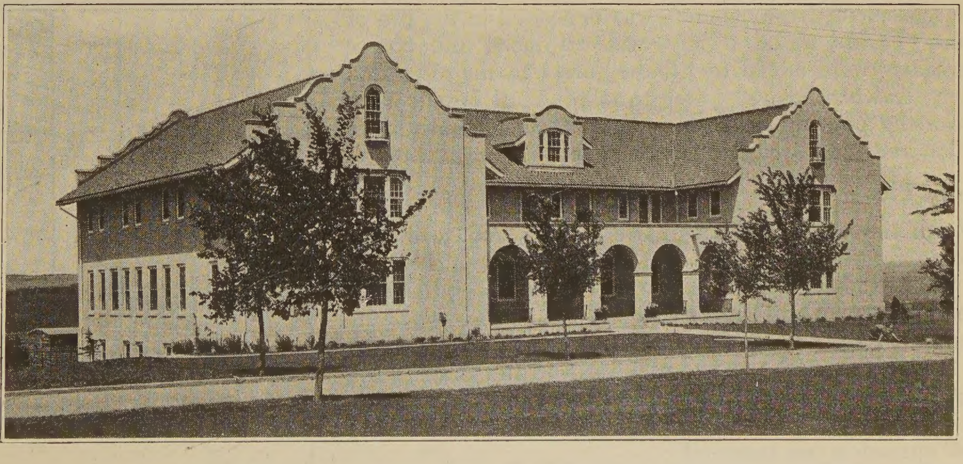
The cost of scaffolding for finishing the walls was minimized by an arrangement whereby (Fig. 5) brackets were nailed every 32 inches to the studs of the 3-foot forms. Across these brackets 2- by 12-inch planks were thrown. The resulting scaffold served many purposes. Serving first as a working ground for succeeding rises in forming, it was available to carpenters on lookout work and trim, painters, roofers and sheet metal workers. The 3-foot form was not released until after the final pouring of the building and all work above had been done. Surfaces uncovered by the removal of the scaffold were reached by means of a movable scaffold.

Specifications called for a 1:2:4 mix. These proportions were selected in a quest for a desired result after tooling. Crushed rock from Cripple Creek was used. This rock is harder, but resembles the color of limestone. The other ingredients used were washed river sand and portland cement. An excess amount of water was everlastingly guarded against.

Placing Concrete

Concrete was spouted to a receiving hopper and from

Especial care was required in the form work for the uncovered monolithic concrete walls in this boys' dormitory



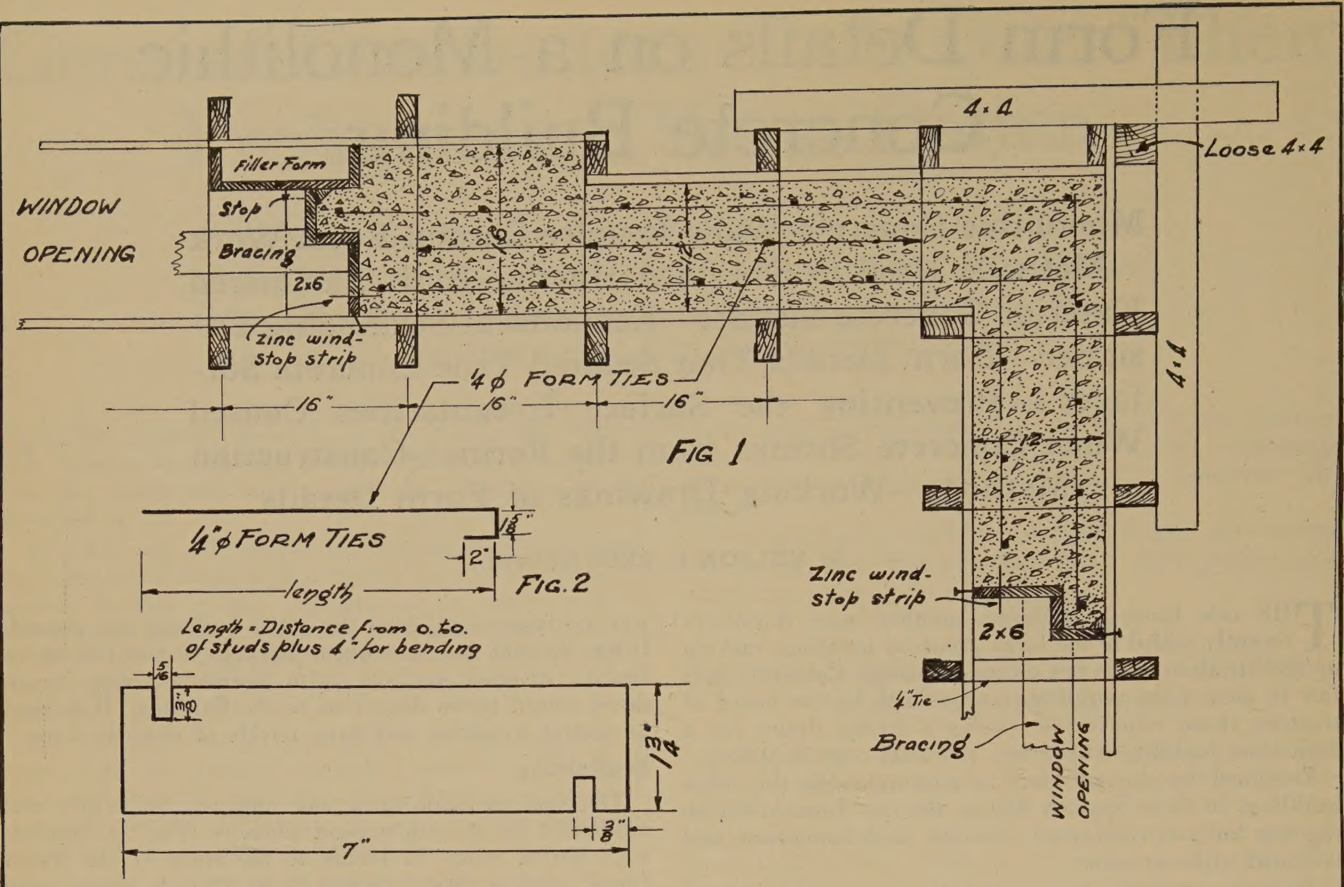


FIG 1

FIG. 2

BENDING TOOL FIG. 3
(¼" STEEL STRAP)

there wheeled to the forms. Care was taken in depositing and careful spading was done to insure the smoothest possible surfaces.

As an aid to the spading and ramming, both sides of the walls were tapped constantly with hammers both during the depositing of concrete and by back tapping a half hour after it was in place. That last operation was stressed as it killed out sand patches where water bled through the forms and carried cement with it.

Laitance

Construction joints are shown in Fig. 5. In the completed building it is very hard to determine where any pouring was begun or ended. To guard against that evidence the following work was done:

After each rise in pouring was made, and after aggregate settlement, fresh concrete was deposited in the top of forms. Excess water, if any, was displaced and coarse aggregates were added to fill the forms to the very top. Later, steel brushes were used to take off all laitance and before the pouring next above was started, a mortar of cement and sand preceded the concrete.

Form Ties

Form ties used were one-quarter inch round steel rods used in reinforcing work. Fig. 2 shows how one end of the pencil rods was bent before delivery to the carpenters. The straight end was thrust through both forms after the forms were set. When the bent end was stapled, (Fig. 4) the tool shown in Fig. 3 was used to bend the straight end tightly around the stud. Then the second end was stapled. With these ties, forms will hold their lines long after the wood spreaders are removed.

In the case of the Lincoln Building, 16-inch horizontal centers were preserved for the ties. When cut for form removal, the 4-inch projections were bent over 1- by 2-inch furring strips, without nailing or stapling. (See Fig. 7.)

The projections of ties on the exterior faces of walls were cut, not too closely, for form stripping, then nicked back about three-eighths inch with a capping chisel. They were then broken off.

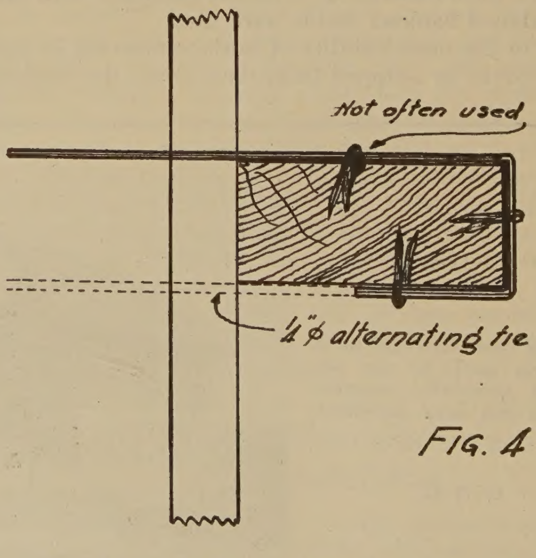


FIG. 4

Securing ¼" ties with polished fence staples

Patching and Pointing Up

This item is mentioned simply because its former venerableness, as a thing to be considered on less careful work, was made prominent on the Lincoln Building by its absence.

Form Work

Forms were built in sections and raised into place by a small hand derrick. Each section had top and bottom plates to make it rigid.

One feature of the quarter-inch ties is that by holding

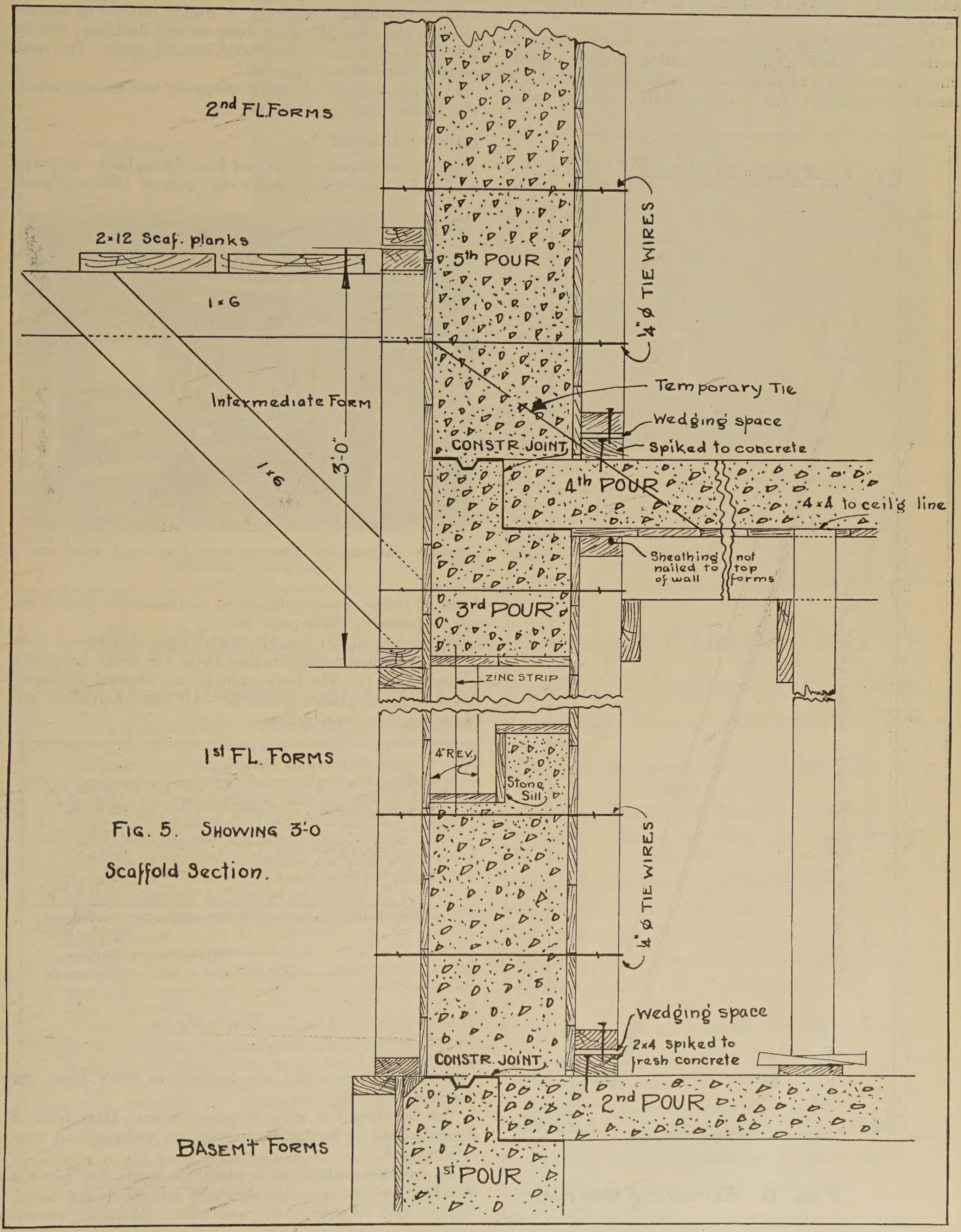


Fig. 5. Showing 3'-0 Scaffold Section.

either the inside or the outside form to line with occasional braces, the form opposite the one braced will maintain its line. Thus, it was practicable to brace only from the inside above the first floor, and bracing was done merely to guarantee straightness.

The outer corners of the building were moulded by the addition of 4- by 4-inch collars (Fig. 1) to insure getting sharp angles.

On the day following the pouring of floors resting on walls, 2- by 4-inch plates were nailed down to within three-quarters inch of inside wall lines. This feature was largely responsible for straight walls. In stripping, (Fig. 6) the form is pried away from the bottom board and swung outward.

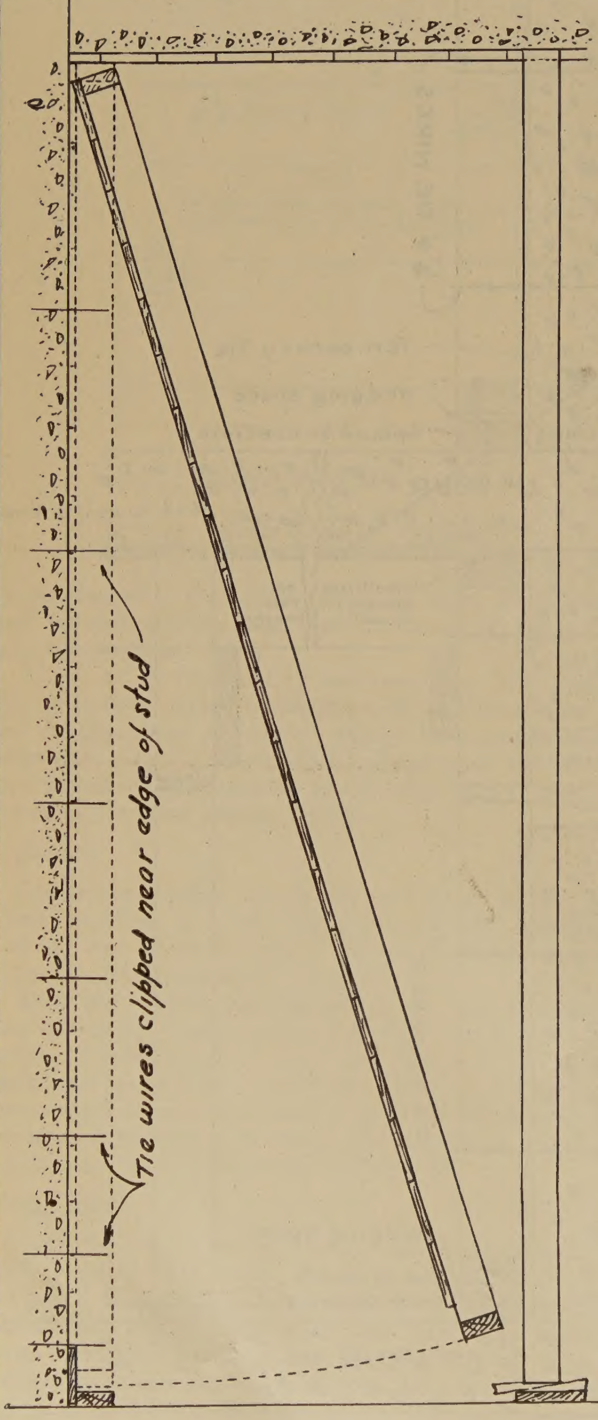


FIG. 6 Removing Wall Form

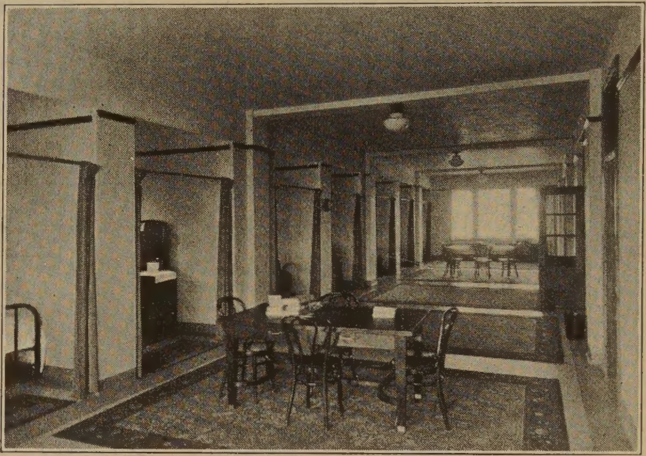
Shrinkage

Always, where a form remains after concreting, there develops an increasing gap between it and the concrete. The almost impossible thing to do is to bring the form back tightly against the wall. A simple method of accomplishing the same thing, as done on this building, was to drive wedges between the sheathing and studs. The next pouring showed no "step out."

Fig. 6 also shows how early stripping was accomplished. The shores were cut to ceiling line.

Building Interior

There are terrazzo floors and base throughout. In preparation for the terrazzo floors the concrete base was steel brushed in the manner described in CONCRETE some time ago. (January, 1924, page 30.)



Some of the cubicles. They are formed by 2-inch metal lath and plaster partitions

The inside of all outside walls received a heavy coat of waterproofing before furring strips for metal lath were placed (Fig. 7). The boys' cubicles are formed of 2-inch metal lath and plaster partitions. All other partitions are of hollow tile construction.

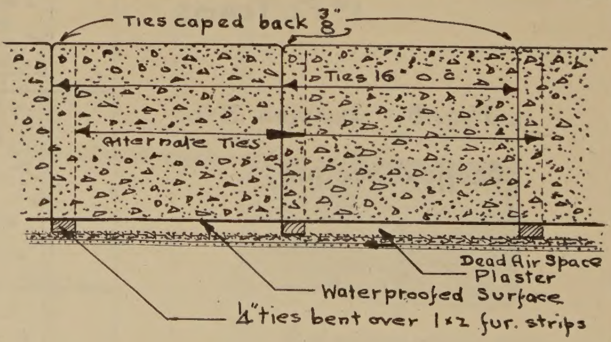


Fig 7. Ext. Wall

Rooms and corridors are finished in birch trim and doors are also of birch.

The building has electric refrigeration. Heat from a central plant is furnished through an underground concrete tunnel.

As each dormitory is a plant in itself, the Lincoln Building has an up-to-date kitchen, a large dining room, library and reading room and office. Matrons' rooms,

The living room and sun room. Heat for this and other rooms is furnished through an underground concrete tunnel from a central plant

boys' cubicles, shower rooms, linen rooms, etc., are on the second floor.

T. P. Barber, architect of Colorado Springs, designed and supervised the construction of the building. The Kimball Construction Company of Colorado Springs, Colorado, were the contractors.

Reinforced Concrete Design Simplified!

For the — Designer — Construction Engineer — Architect — Contractor

No matter what your particular interest in the uses of concrete is — whether you are a designer, an architect, a construction engineer or a contractor, there are many instances when you have longed for a simple, time-saving method of solving the design problems your work presents.

Such a simple, practical method has been developed. All that you need to do to arrive at the answer to your problem is to lay a ruler across a chart, using the known requirements to fix the position of the ruler, and then read the answer to your problem at another point on the rule. You don't even need to remember your mathematics or design formulas.

The author of this series of articles, Prof. J. R. Griffith, of Armour Institute of Technology, Chicago, worked out this method while he was engaged in the field and office on a number of concrete jobs in various parts of the country.

The charts were devised to meet practical problems in a practical manner.

The first article in the series will be published in the March issue. Look for it!

Solutions of these problems will be presented:

Chart A.	**Balanced Tensile Reinforcing for Beams.**
Chart B.	**Dead Load Beam Information.**
Chart C.	**Choice of Steel for Beams and Columns.**
Chart D.	**Diagonal Tension and Shear.**
Chart E.	**Stirrup Spacing.**
Chart F.	**Web Reinforcing.**
Chart G.	**Unit Stress in Compressive Steel.**
Chart H.	**Area of Compressive Steel for Beams.**
Chart I.	**Area of Steel for "T" Beams.**
Chart J.	**Concrete Stress in 'T" Beams.**
Chart K.	**Reinforced Concrete Slabs.**
Chart L.	**Choice of Steel for Slabs.**
Chart M.	**Spiral Reinforced Column.**
Chart N.	**Spiral Reinforced Long Column.**
Chart O.	**Column with Lateral Ties.**

How's Business?

General business conditions are the basis upon which any individual industry must estimate its own probable future accomplishments.

With this point in mind, the following authoritative analysis of present business conditions is presented. The opinions are not those of any one individual. The facts as presented were gathered by the editors of business papers in every field and as such represent a true composite picture of business conditions throughout the country.

The concretor can readily see how he can apply the facts presented to his own business and thus be ready to adjust his activities in line with the general trend in all industries.

INTENSIVE selling and pressure to lower production costs characterized business for 1927, and 1928 will develop along the lines of the year just closed, according to the consensus of one hundred editors of trade, industrial and professional journals in answer to a questionnaire sent to them by the National Conference of Business Paper Editors and the Associated Business Papers.

Business is sound. There are no indications of a slump, but rather definite indications of increase in several lines. No excess inventories are reported either in wholesale or retail, except in a few specialties where the market has been over-estimated. Farm buying power will be larger in 1928.

Indexes of trade which measure week to week activities, such as electric power used, output of pig iron and steel ingots, building construction, and freight loadings are slightly over or slightly under those of 1926. Power used in 1927 increased seven per cent over the previous year. Pig iron totaled 36,300,000 tons, putting 1927 in eighth place among big years. Steel ingot output was about eight per cent less for 1927 than in 1926, making 1927 fifth among years of largest output. Total construction was down, but up two and one half per cent in industrial building and eleven per cent in heavy construction.

Editors of papers report increased pressure to reduce production and selling costs, higher specialization in machinery, widespread replacement of obsolete and inefficient machinery, aggressive market finding, reduction in size and intensive development of jobbing areas. There is likewise a genuine desire to keep wages at their present level in all the basic industries and manufacturers and merchants are seeking to continue with narrow profit margins without reducing wages or raising prices. Some trades show softening in prices, but most trends indicate price of 1928 about the same as 1927. Volume of railroad freight declined especially in the latter part of 1927, but in common with other trades there is expectation of an increase in freight during 1928. Gross revenue of bus lines was 25 per cent higher in 1927 than in 1926 and total pay rolls were up 30 per cent. Volume of water borne freight was slightly greater in 1927 than in 1926, and tonnage rates held steady.

General construction is reported lower due to reduction of residential building, with industrial construction and certain classes of public works building very much increased. Heavy construction is eleven per cent higher, industrial construction is two and one-half per cent higher, electric light and power plant construction about five per cent over 1926, with an estimated additional five per cent increase in 1928. It is expected that some $940,000,000 will be invested in construction and equipment in the electric light and power industry in 1928. During 1927 a million dollars a day was spent for new hospital buildings, and the rate for next year will be higher.

In the automotive industry expenditures for new plants were larger in 1927 than in 1926 due especially to one or two very large construction enterprises and the remodeling of the Ford plant. New construction in the textile field increased with an accompanying fact that many obsolete plants were modernized or dismantled. Rehabilitation of private power plants continued through 1927 and promises to be still more active in 1928. Fourteen new cement plants went into active production during the year.

High specialization in machinery to reduce production costs marked several basic industries. In the cotton and rayon division of the textile industries plants have been brought up to very high efficiency. Steel mills averaged 75 per cent of capacity in 1927 against 83 per cent in 1926; pig iron capacity 73 per cent in 1927 against 80 per cent in 1926. In metalworking lines the average of working operations was about 15 per cent less than in 1926. Nineteen twenty-eight is expected to equal 1927. Railway equipment was used to greater efficiency in 1927. In the furniture trades there was about 90 per cent use of equipment.

The total pay rolls in practically all industries commented upon by these editors were less in 1927 than in 1926. The notable exceptions were in the field of transportation. Railroad pay rolls were advanced about $60,000,000 and those of the companies operating bus lines increased 30 per cent. Although there was a general shrinkage in aggregate pay rolls the hourly rate of workers changed little and there are no important indications of downward wage revisions during the coming year.

Prices throughout 1927 are reported as slightly lower and margin of profit less but the outlook for 1928 is generally considered favorable with some slight price increases. Pig iron prices during 1927 averaged ten per cent less than in 1926 and steel prices were four or five per cent less.

In general the close of 1927 finds the industries of the United States with stocks which deviate little from the volume at the close of 1926, reflecting continued hand-to-mouth buying.

Members of Ohio Products Group to Meet

Members of the Ohio Concrete Products Association will meet for their annual convention at Cincinnati, Ohio, on February 14th to 16th, inclusive. Headquarters will be established at the Gibson Hotel.

Bookkeeping— The Key to Profit *in Products Plants*

The First Article of a Series Showing How Accurate Bookkeeping Increases Profits and Setting Forth a Simple and Dependable Method of Keeping the Necessary Records — Practical Examples Are Given, Showing How Manufacturing Costs Can Be Reduced When the Operating Facts Are Known—Methods Can Be Applied to Any Products Plant

By WILLARD R. GINDER, C. P. A.
Formerly Assistant Treasurer, National Building Units Corporation

RECENT reliable estimates show that the concrete products industry is now producing over $140,000,000 worth of units annually, and that continued development of the industry will depend largely upon the ability of manufacturers to produce standard quality units which can be sold at a profit in a highly competitive market.

As might be expected, expansion of the industry and apparent opportunities for profit are attracting others, and new plants are rapidly springing up. This has already brought about severe competition among block manufacturers in some localities, and it is to be regretted that some of this competition has been not only keen, but also a little vicious, at times.

Competition with other products cannot be avoided generally, and may be considered a healthy business factor. This may also be said of inter-plant competition, provided it is of healthy variety. But inter-plant competition, which is accompanied by price cutting to below the profit line or reduction of quality to below standard, is not healthy and is almost certain to result in harm to the industry.

It is with the hope that general improvement in methods of keeping books may help remedy the situation to some extent, and be of benefit to the industry, that the following is presented.

Low Office Expense May Not Represent Real Economy

Many block manufacturers take considerable pride and comfort in the low expense at which their offices are operated. This attitude is at times unfortunate, and as a general policy, may be unwise. If we operate a good automobile on the cheapest gas and oil obtainable, and change the oil too infrequently, we will probably be dissatisfied with the performance of the car. We will not be giving the car a fair chance to demonstrate its true worth.

In the same way, office expense may be reduced to the point where the office only partially performs its true functions. This results in burdening the plant manager with details, and in requiring him to base many of his decisions upon suppositions rather than upon facts.

The Office and Profits

If money saved is equivalent to money earned, and it undoubtedly is in many ways, a properly organized and conducted office in a block plant will more than earn its right to existence in most cases.

A fairly high-grade office man in a block plant will not only keep good books and records, but he will also greatly assist the plant manager in regulating credits, making collections and watching operating expenses and costs. He will also efficiently handle many inquiries, orders and complaints of customers and prospects, whether made in person, by mail or by telephone, thus leaving the plant manager free to devote his time and attention to the things which he considers most important.

The low-priced office man cannot be expected to do much but keep a simple set of books and plant records.

Bookkeepers Often Handicapped by Poorly Designed Procedure

Even a good bookkeeper is likely to be severely handicapped if he is obliged to follow poorly designed procedure. Most bookkeepers have not had thorough training in designing procedure, and have had limited experience in the industry, so that they are not equipped to do broad constructive planning.

It is true that good bookkeepers often suggest worthwhile changes in details of books and forms, but they are generally so occupied with details that they have little or no opportunity to obtain a broad perspective of the situation.

Standard Procedure for the Industry

Standard outlines of accounting procedure have been designed for and are used by many industries. Such outlines are usually made flexible enough to be adaptable to plants of any size, and they give to all plants the benefit of the best thought on the subject. They also give uniform meanings to all accounting and cost terms used, and make comparisons of accounting and cost factors among plants of definite value.

The adoption of such a procedure by the block industry would undoubtedly be highly beneficial, provided it received united and whole-hearted support, and it is hoped that such action will be taken in the not too distant future.

Such a standard procedure should be designed with great care, and only after thorough investigation and research on the part of the accountant, in collaboration with engineers experienced in the industry and practical plant operators.

It will, therefore, be understood, we hope, that the methods presented herein are not suggested for adoption as standard. They are presented for consideration, criticism and trial, and as a possible foundation upon which further development may be based.

It is not difficult to produce units that will meet standard requirements, but to do so *at the lowest cost or at a cost which will result in reasonable profit,* involves satisfactory solution of a number of problems. These problems arise in relation to: Aggregates, water control, cement content, mixing time, molding and curing.

Satisfactory solutions of such problems usually require careful engineering tests and studies, supplemented by, or made in conjunction with, corresponding cost studies.

In making cost studies and tests, it is essential that accurate data be used as the basis of computations, and the required data should be obtained from the accounting records. If these records have been designed properly, the required data will be obtained without waste of time and effort.

The problem of determining the most economical mixing time will serve as an excellent illustration of how cost studies may supplement engineering tests. It would be interesting to know how many block manufacturers would be readily able to obtain the data required, for the solution of this problem, from their accounting records.

Most Economical Mixing Time

The relationship between mixing time and proportion of cement necessary to produce a product of standard quality has recently been the subject of considerable investigation and discussion. It seems to be generally conceded that increases in mixing time, up to a certain point, are accompanied by decreases in the proportion of cement necessary in the mix. This is probably dependent upon the use of aggregate of uniform character and quality, and the maintenance of correct water ratios.

If succeeding equal increases in length of mixing time were accompanied by equal decreases in proportion of cement necessary, the relationship between the two factors would be represented by a straight line, if presented graphically, like that shown in Figure 1.

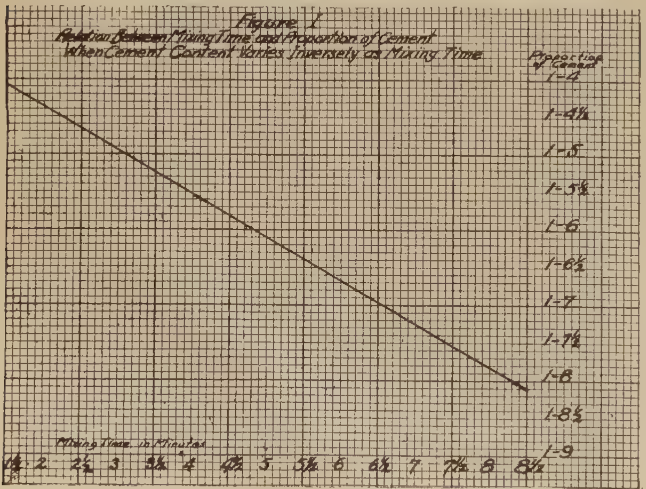


Figure 1. Relation between mixing time and proportion of cement when cement content varies inversely as mixing time

This does not always seem to be the case, however, and a graphic representation of this relationship will probably be found to take the form of a descending and ascending curve. Let us assume that a series of tests made by an engineer in a certain plant resulted in the construction of a curve like that shown in Figure 2.

This curve, if constructed from actual test data, would indicate 7 minutes to be the most economical mixing time, from the viewpoint of cement consumption, in that particular plant and for that particular character of aggregate and water ratio.

It would not, however, indicate 7 minutes to be the most economical mixing time from the point of view of total manufacturing cost or profit and loss. The true cost of the extra 2 or 3 minutes of mixing, plus the increased cost of blockmaking due to reduction in normal capacity of the plant, may more than offset the value of the cement saved.

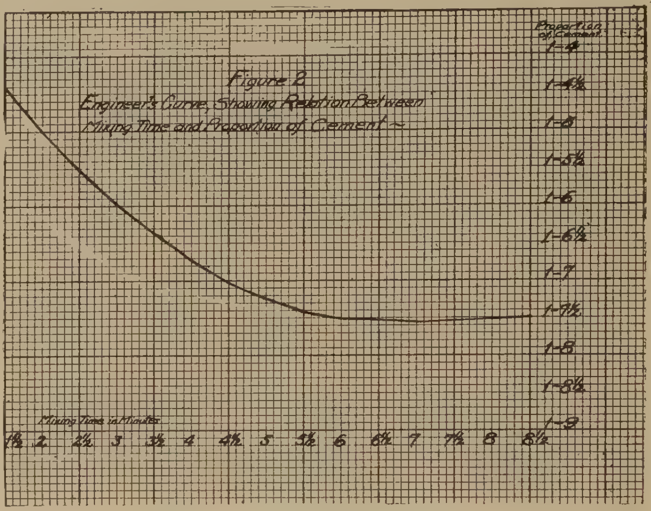


Figure 2. Engineer's curve, showing relation between mixing time and proportion of cement

To determine the most economical mixing time, we must know the effect of changes in mixing time upon true cost of manufacture per unit.

To determine this, the engineer's curve presented in Figure 2 is first converted into a curve portraying the relationship between mixing time and cost of material per unit produced. Any type or size of regular unit may be made upon the subject, but all succeeding computations must be based upon the same unit. Such a curve is presented in Figure 3.

Excluding material cost, we now compute the true manufacturing cost per unit corresponding to each period of mixing time shown in Figure 3. It will probably be found easiest to compute these costs in two parts:

(1) Material Preparation Cost—labor and overhead incident to handling and preparing materials, from storage to delivery to molding machines.

(2) Molding and Curing Cost—labor and overhead incident to block making, from feeding machines to delivery of blocks to permanent storage place.

Using this cost data, and the data contained in the converted engineer's curve (Figure 3), we now construct another curve. This curve will portray the relationship between length of mixing time and total manufacturing cost. Such a curve is illustrated in Figure 4.

What the Curve Shows

This curve, if constructed from actual test and cost data, would indicate 4 minutes to be the most economical mixing time for that particular plant, using the character of aggregate and the water ratio used in the tests. This mixing time, with the corresponding proportion of cement shown on Figure 2, may be adopted as standard for units of that type, provided that uniformity of character of aggregate and correct water ratio are maintained.

Due to the use of different machinery for molding units of various types and sizes, it will usually be necessary to construct a curve like that shown in Figure 4 for each combination of molding machinery which may be in use at any time. If a plant has 3 molding machines, and it is necessary to operate 2 of them at once to utilize the output of the mixer, there will be 3 combinations possible, in at least 2 of which the unit under consideration may be molded. A curve should be constructed for each combination in which the unit may be molded, and it may be found that the most economical mixing time will be different for each combination.

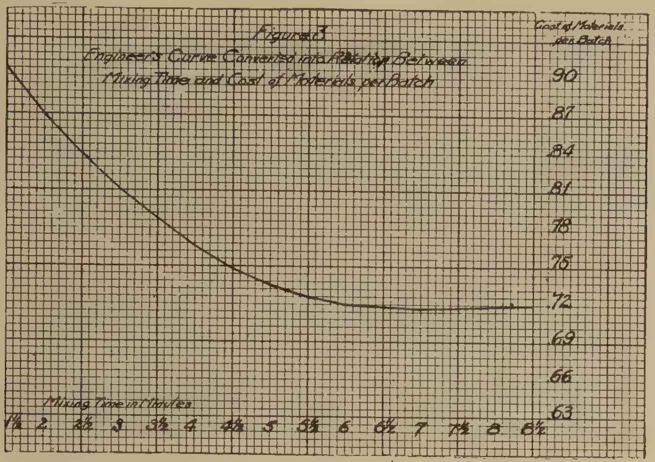


Figure 3. Engineer's curve converted into relation between mixing time and cost of materials per batch

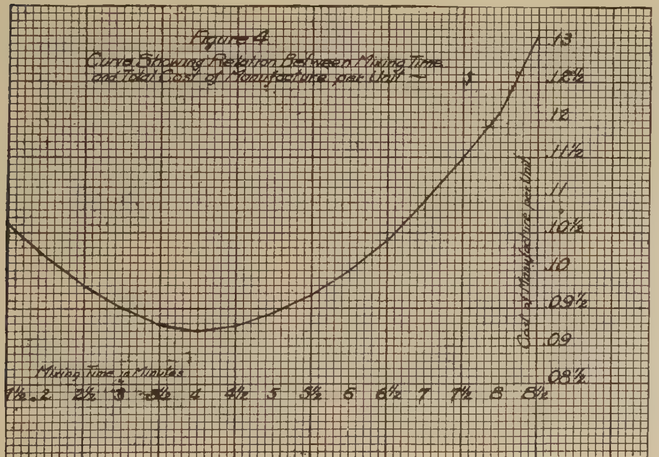


Figure 4. Curve showing relation between mixing time and total cost of manufacture per unit

It may occur that, although the engineer's tests have been made with aggregate of proper fineness, the strength and character of product varies in actual production because the character or fineness of aggregate varies. The fault will not necessarily lie with the use of standard mixing time and proportion of cement, but may be laid to the variation in aggregate. In such cases, steps must be taken to insure a flow of aggregate of uniform fineness.*

If the most economical mixing time, as determined by computations like those described above, results in lowering plant output more than is desired, the installation of a larger mixer should be considered.

The probable results of such a change can be forecast by another computation, similar to the above, and based upon the same data. Power costs and depreciation charges will increase, and number of units produced per batch will increase, thereby necessitating slight revision of the curves. The new set of curves will then portray the most economical mixing time, and corresponding manufacturing cost, which will probably follow installation of the larger mixer.

Such tests and computations as the above should be made with great care, so that errors may be reduced to the minimum, and so that those which are inevitable will be properly allowed for or offset. Co-operation of an engineer and an accountant, each of whom knows something of the other's subject and point of view, and who are both experienced in the industry, would probably produce the most reliable and valuable results.

Purpose of Keeping Records

All sound business plans must have for their object the attainment of the desired results at lowest cost, and no cost however low can be satisfactory if the desired results are not obtained.

We must first consider the results desired, therefore, in planning our accounting procedure.

Any good system of accounting must possess certain basic qualities, which are known to all bookkeepers and need not therefore be discussed here. For our purpose, we wish to know what particular results are desired from the accounting procedure by block manufacturers. Some of these are as follows.

(1) True manufacturing cost of each type and size unit produced, by stages of manufacture, with details of items composing each stage; so that intelligent comparisons with prior periods and with other plants may be made; and so that data will be available for studies like that on mixing time given above.
(2) Monthly profit and loss. After providing for all expenses incurred, and for all probable discounts, allowances and credit losses incident to the sales made during the month.
(3) Probable net realizable value of accounts receivable at the end of each month.
(4) Quantities and laid-down values of materials on hand at the end of each month.
(5) Quantities of each type and size unit on hand at the end of each month, valued at cost.
(6) Average net selling price, manufacturing cost and non-manufacturing expense per 100 pounds of finished product, or other unit of measure, for each month.

Of the above, the one stated first—i.e., true manufacturing cost, is the most difficult to obtain and has the greatest influence upon the design of our procedure.

Manufacturing Cost

True manufacturing cost can only be obtained by careful application of sound accounting principles. If overhead, which consists of all items of cost except materials and direct labor, is lumped and applied to unit costs on some arbitrary basis, the result cannot be termed "true cost," even in a plant which has only one molding machine.

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*Uniformity of character of aggregate requires that both quality and grading or fineness run uniform. Coarse aggregate will usually produce stronger units than fines, but certain proportions of fines must be used to obtain other qualities in the product. Tests should therefore be made to determine the character of aggregate which is most economical for each type of unit manufactured.

There are a number of varieties of costs which may be termed "true costs"; such as, actual cost, standard cost, budget cost, normal budget cost, etc. Although we hope that the industry will at some time adopt the normal budget method, our remarks will be confined to the computation of actual costs, for the sake of clarity, brevity and simplicity.

With the possible exception of direct labor at piecework rates, all data for use in cost computations should be obtained from the financial books, or from records controlled by or "tied in" with the financial books. Any deviation from this rule is dangerous, and should not be permitted.

Material

We are interested in more than the mere purchase price of materials. We wish to know the cost of materials delivered to the storage space, from which they are taken to be placed in process. We may wish to know, however, how much of this "laid-down" cost of each kind of material consists of purchase price, and how much consists of freight, cartage, material handling and storage costs.

To obtain this information, a group of accounts may be opened for each kind of material used, as follows:

Inventory—Which contains the value of inventory on hand at beginning of year.

Purchases—To which invoice cost of purchases, less trade discount and value of containers, is debited.

Testing, Freight, Cartage, Handling, Storage—To which such items as the names of the accounts indicate, incident to acquisition of material, are debited.

Cost of cloth cement sacks, included in prices on cement purchase invoices, should be debited to a suspense account. This account is credited upon disposal of sacks, and its balance represents the value of all sacks on hand at the end of each month, whether they are empty or still contain cement.

Bulking of sand due to high water content, which may be eliminated by measurement of sand under water, introduces quite a problem with regard to character of aggregate and water ratio. The method suggested below however, eliminates bulking as an accounting problem, in that total materials used are spread over blocks produced in such a way as to average the sand volume. Some variation in number of units produced per batch may result from bulking, but use of the average number produced per batch over a period of several months will probably eliminate it as a factor of consequence.

Suggested Schedule

At the end of each month, a schedule somewhat like the following is prepared with a bracket for each class of material:

	CEMENT			**AGGREGATE		
	Sacks	Price	Value	Yards	Price	Value
1. Inventory — first of month						
Add:						
2. Purchases						
3. Freight						
4. Cartage						
5. Handling						
6. Testing						
7. Totals		*			*	
8. Used in Manufacturing		*			*	
9. Sold		*			*	
10. Used — Other purposes		*			*	
11. Totals used and sold						
12. Inventory, end of month		*			*	
13. Totals						

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*Obtain by dividing total of quantity column into total of value column.

**When a self-contained aggregate is used, i.e., naturally mixed aggregate or prepared aggregate like Haydite or crushed cinders, only one column for aggregate is necessary. If aggregate is mixed in the plant, one column for each kind of material entering the mixture will be required.

In each bracket:

Inventory at first of month is inserted on line one, placing quantity and value in appropriate columns. Quantity purchased during the month is then inserted on line two in the quantity column, and total debits for the month in each of the accounts listed are inserted in the value column on the appropriate line. Care must, of course, be exercised to see that all invoices applicable to the month have been entered.

It will be readily seen that the total of the quantity column divided into the total of the value column will give "laid down" value or cost of material per bag, yard, etc. This amount is determined and placed in the price column on line 7.

Quantities used and sold during the month are now inserted on lines eight, nine and ten, and quantity on hand at the end of the month (determined by physical inventory if possible) is inserted on line twelve.

These amounts are now multiplied by the price on line seven and the results are placed in the value column.

Quantity and value columns are now totaled, and amounts on lines seven and thirteen in the same column should equal each other.

Journal entries may now be made, debiting Cost of Materials Used in Manufacturing by amounts on line eight, Cost of Material Sold by amounts on line nine, and appropriate accounts for any amounts on line ten, and crediting Cement Relief, Aggregate Relief, etc., by the amounts on line eleven.

Material Cost Per Unit

There are two sound methods, whereby total material cost for a period may be allocated to the various type and size units manufactured, which we think deserve consideration.

By the first method, cost of material used per batch is obtained, and this divided by the number of units obtained per batch will give the cost of material per unit. If more than one mixer is operated and mixers of different capacities are used, it will first be necessary to know how many batches have been mixed by each mixer, and how many one-sack batches this is equivalent to. Cost of material per one-sack batch is then computed, from which the cost of material per batch of any size may be determined.

It will be necessary to keep records of the number of each type and size unit obtained per batch for each size mixer, and the number of batches made by each mixer during the period. This information, and the total cost of material used for the period which is obtained from the books, are then used as noted above.

The above computations are expressed in formula form, as follows:

Cost of Material Used (from books) *divided* by Number of One-Sack Batches mixed *equals* Cost of Material used per one-sack batch.

Cost of Material Used per one-sack batch *multiplied* by bags per mix *equals* Cost of Material Used per Batch.

Cost of Material Used per Batch *divided* by Number of Units Produced per Batch *equals* Cost of Material per Unit.

By the second method, cost of material used per pound of dry-weight produced is obtained, and this multiplied by the dry-weight of any unit will give material cost per unit.

The average dry-weight of each type and size unit manufactured is obtained by selecting three good specimens, breaking them to pieces, drying the pieces over the boiler and then weighing them. One-third of the weight so obtained is considered average dry-weight of that type and size.

Total dry-weight produced during a period equals the aggregate of totals obtained, by multiplying the number of each type and size unit manufactured by its dry-weight.

Cost of material used per pound of dry-weight produced is obtained, by dividing cost of material used for the period by total dry-weight produced during the period.

These computations are expressed by the following formulas:

For each type and size unit: Number of Units Produced *multiplied* by Dry-Weight per Unit *equals* Dry-Weight Produced.

Total Dry-Weight Produced equals Dry-Weight Produced (one type and size) *plus* Dry-Weight Produced (next type and size), *plus*, etc.

Cost of Material Used (from books) *divided* by Total Dry-Weight Produced *equals* Cost of Material per Pound of Dry-Weight Produced.

Cost of Material per Unit *equals* Dry-Weight of Unit *multiplied* by Cost of Material Used per Pound of Dry-Weight Produced.

The dry-weight method is recommended, inasmuch as the dry-weight data is useful for other purposes, and the method is easy to apply; but we also suggest that the records required for the first method be kept for other uses.

In preparing material cost data for comparison between different periods or different plants, it is suggested that the items constituting cost of materials used for the period be shown in detail somewhat as follows:

Laid-down Material Costs

	Cement per Sack	Aggregate per Yard
Purchase cost	--------	--------
Freight	--------	--------
Cartage	--------	--------
Testing	--------	--------
Storage	--------	--------
Handling	--------	--------
Total	--------	--------

Such an exhibit will enable any differences in total costs to be traced at once to the items responsible, thereby indicating the lines along which investigations need be made.

Material Preparation Cost

The first stages of block manufacture consist of removing materials from storage, preparing and mixing them, and delivering the mixed aggregate to the molding department. We have termed this portion of the manufacturing process Material Preparation.

The cost of material preparation consists of direct labor and certain portions of manufacturing overhead expense. It is determined in total for the period, and is allocated to specific types and sizes of units by the method used for allocating material cost. Determination of total material preparation cost for a period will be described in detail, in our discussion of Direct Labor and Manufacturing Expense.

Cost of materials used plus material preparation cost has been termed Prepared Material Cost. It represents the cost of mixed aggregate at point of delivery to molding machines.

It may be that certain types of units are made of richer mix with shorter mixing time than others, or the reverse, so that costs per unit obtained by the above methods are not considered accurate. Under such circumstances, prepared material cost per unit may be determined by computations similar to those used in our study of mixing time. The results obtained should be thoroughly tested, however, by multiplying the cost obtained per unit of each type and size by the number of such units manufactured, and comparing the grand total so obtained with the total prepared material cost for the period.

Some slight changes in the procedure outlined above will be necessary for plants manufacturing face blocks. Materials used in making faces should not be included in the regular material accounts, and the cost per unit of such materials should be independently computed, and added to material cost as obtained by the methods outlined above. Dry-weights of such units, for use in allocating material and material preparation costs, should not include weights of faces.

(To be continued)

Concrete Canyon Foot Bridge Rests on Spread Legs

A concrete foot bridge found in the outskirts of a Nebraska town has the units of the supporting members cast upon the ground in forms of wood built for them. The top members fit on the top of the spread legs, whose upper ends carry ½-inch iron rods that in turn fit in holes for them in the lower side of the top pieces.

With only a limited amount of weight to carry at a time, the legs are simply set in holes dug for them in the canyon banks and bottom. It is noticeable, however, that these holes are not only dug deep, but that a thick, flat stone was sunk in each before the concrete pieces were set in place.

The top surface is an ordinary cement walk with woven wire reinforcing. Forms to take this were set up after the legs had been set in place. The top walk was, of course, cut down to the wire to take care of expansion and contraction. The railing, of angle iron and more woven wire, gives ample protection.

Are You Going to Philadelphia?

The Twenty-Fourth Annual Convention of the American Concrete Institute Offers an Exceptional Program — A Program Too Good for Any Concrete Specialist to Miss

THERE is nothing surprising about the fact that a very fine program has been prepared for the twenty-fourth annual convention of the American Concrete Institute. In fact, it would be difficult to point to any of the past programs of the Institute which were not deserving of praise. The really surprising thing is that the program prepared for the coming convention is not only able to hold up its head alongside the fine convention programs that have gone before it, but actually shows symptoms of surpassing them. From the information now available it looks as though the 1928 convention was going to be the finest one ever held by the Institute.

Among the many excellent papers prepared it is difficult to select one which is of more importance than the rest. But certainly the paper to be presented by Arthur R. Lord is entitled to a place well up toward the top of the list. Mr. Lord's paper is entitled "Design and Cost Data for Proposed 1928 A. C. I. Standard Building Code." The first part of this paper will supply a complete set of designers' aids for the use of engineers in those cities where the A. C. I. code had been adopted or is accepted in use. It includes 69 special design tables which are worked out on the basis of the A. C. I. code requirements, and which greatly simplify the work of design when carried out in accordance with A. C. I. standards. The second part of the paper, to quote from the A. C. I. news letter of November 30th, "is a study of the relative economy of various designs under the A. C. I. code and includes tabulated quantities of materials required for one complete interior panel from foundations to roof for 96 buildings of flat-slab or beam-and-girder type."

This year's convention will follow the precedent of last year by opening with a "get-together" luncheon at noon on February 28th. This will be followed immediately by a session on workability at which six rather brief papers will be presented and discussed.

The evening session of the same day will be given over to features having a special architectural appeal. Among the other papers presented at this session will be one by Mr. W. E. Hart, manager of the Structural and Technical Bureau of the Portland Cement Association, on the subject of "Reinforced Concrete Walls for Buildings." Mr. Hart has been in a position to observe very carefully the development of this type of wall, and his summary of what has been done along this line, and what is reasonable to expect in the future will be of great interest to every contractor and architect who is working in concrete.

Three sessions are scheduled for February 29th. The one in the forenoon will probably be devoted to materials and research, the one in the afternoon to cast stone and concrete specialties, and the evening session to reinforced concrete design. On March 1st there will be a morning session devoted to the problems involved in the manufacture of standard concrete building units, and an afternoon session given over to field problems. At 6:30 there will be a dinner, and an address of general interest. At this dinner there will also be presented the Turner and Wason medals.

Among the interesting papers which are already prepared for presentation on these two days is one on "A Method for Predicting Concrete Strength with Increased Precision." This is a particularly important subject to everyone in the industry, whether their interests be financial or scientific, and it is certain to be received with interest.

As usual at conventions of the Concrete Institute, there will be presented considerable material drawn direct from job experience. Among the interesting subjects are the building of the Santeetlah Dam, which will be described by I. E. Burks, engineer of tests on the work; the design and construction of the West 9th Street Bridge, Chester, Pennsylvania, with particular reference to the skew arches involved in the design; and a new and apparently quite satisfactory method of floor finishing which has been worked out by Charles E. Covell, eastern construction manager of the Austin Company.

As noted elsewhere in this issue, the concrete products industry will be represented by a number of important papers. Not only will there be a discussion of technical problems of the industry, but there will also be a paper by George J. Eyrick, Jr., of Smith, Hinchman and Grylls, architects and engineers, of Detroit, which will state very frankly just what the present attitude of the practical architect is toward concrete building units. Although we have no intimation what Mr. Eyrick is going to say, we are inclined to think that his paper will contain many valuable hints to products men, and that he may possibly point out ways in which a greater acceptance for concrete building units can be secured.

Incomplete though it is, this brief survey of the program of the coming convention should be sufficient answer to any doubts that you may have had as to the advisability of attending the convention. Although we plan to print a comprehensive report of the proceedings, it is impossible to get from the best of printed reports the full value of such a convention as the coming one. Members of the Institute who have attended past conventions will realize the truth of this without any special comment on our part, and those who are not members of the Institute will need but this one experience to make quite clear to them the value of such an association and its annual gatherings.

If you have not already done so, our suggestion is that you wire your favorite Philadelphia hotel (the convention itself is being held at the Benjamin Franklin Hotel) to reserve a room for you, and find a way to get down there and occupy it during the three days, February 28th, 29th, and March 1st.

Wisconsin Products Publication

In place of the weekly calendar it has been distributing among its members the past few years, the Wisconsin Concrete Products Association with the new year is publishing a weekly article known as the "Inquiring Promoter." The answer given to some question of common interest to the industry by a products manufacturer is featured in the article.

EDITORIALS

Price Cutting

FROM some of the many letters that have come in commenting on the articles "A Profit in 14-Cent Block," published in the November and January issues of this journal, we received the impression that some of our readers thought that we might be advocating price cutting in the selling of concrete products.

We want to take this opportunity to put our readers clear on that point. The articles in question did not present any statements that could be considered as a defense of the price cutting tactics pursued by some products manufacturers. Such practices are detrimental and those who follow them not only harm themselves but the industry as a whole.

We did feel that a products manufacturer who could make quality block and sell them at a profit for 14 cents, had a very efficient plant. We realized that there were some points in his plant layout and manufacturing methods that would suggest possible improvements which could be applied to the plants of some of our readers. If there were any facts presented that would enable even a few of our readers to make a reduction in their manufacturing costs, the article accomplished its purpose.

We have repeatedly urged the value of co-operation between products plants in these columns. We believe that with the newer competition of industry against industry, it is doubly necessary for the men in the same industry in any locality to join in an effort to compete with the merchandizer of competitive materials.

It is because of this newer competition that refinements in operating practice and economies in block manufacture are becoming more and more necessary. Prices should be based, and must be based, on known manufacturing costs plus a reasonable profit. Rather than basing them on competition between concrete block manufacturers themselves, prices should be gauged so as to enable block to be sold in competition with other building materials.

Products manufacturers equipped and able to meet this inter-industry competition are prepared for present-day conditions. If they can show a profit under those conditions the chances are that better methods are used, that they have a better knowledge of costs and of merchandizing than those who cannot meet the competition.

Those facts must be faced. The concrete products industry is not exempt from the keen competition that faces all other industries also. Such conditions are merely the inevitable developments that indicate growth.

It is the aim and object of this journal to present such articles to its readers as will help the greatest number of them. That the article referred to has met this requirement is attested by the many letters and comments received to that effect.

Footprints of the Engineer

IT is good for the builder that once in a while someone better trained in the art of expressing appreciation in words than he steps forward and tells the builder just what his work means to humanity.

Such an appreciation, given by a lawyer, constituted one of the most interesting papers presented at the recent convention of the American Road Builder's Association at Cleveland. Wedged in on the program between two technical papers, this lawyer, J. B. Weaver of Des Moines, Ia., stood before a group of engineers and told them what their work meant to the safety, comfort and progress of humanity.

It is a characteristic of the builder that he is willing to work in obscurity, content to let his work speak for itself. He seldom stops to speak of his work as it relates to the advancement of civilization. Often he does not even formulate the thought clearly in his mind.

Yet it is this consciousness that he is doing something worth while that encourages the builder to do his work well. The completed job—be it a highway, a dam, a skyscraper or a basement foundation—is his expression of the creative impulse that made him choose his work.

That someone else usually gets his name on the bronze tablet or the corner stone is of little concern to him. He knows that the work was well done, that he has been true to his trust and that the structure stands, a testimonial to his ability and his integrity.

It is gratifying that, in some small measure at least, the builder's work is beginning to receive recognition. On a few jobs—the building of a canal, a railroad and a tunnel—the engineer has been honored as one of those who helped make the improvement possible.

The builder's job is service to humanity. Through the construction of highways, railroads, tunnels and bridges he banishes isolation, the foe of progress. Through his irrigation systems he brings fertility to the land. Through his buildings he brings shelter, safety and comfort to mankind.

Can any other work be more worth while?

Another Light-Weight Masonry Unit

"Bubblestone" Is the Name of a New Light-Weight Concrete Masonry Unit Now Available in California — Weight of Product Can Be Varied—Some Tests

A NEW solid concrete masonry building unit of light weight, made under the trade name of "Bubblestone," is available in San Francisco and vicinity since the establishment of a manufacturing plant at Monterey, Calif., one hundred miles south of San Francisco.

The new product is made under a process in which ordinary concrete materials are used, except that coarse material is omitted. The weight of the product can be varied at will, through a variation in the air-cell space; but with all other things remaining equal, the strength decreases with the weight.

Tests

This relationship is shown in a laboratory report dated June 24, 1927, issued by Abbot A. Hanks, Inc., of San Francisco, and in the diagram in Figure 1, in which the results of the laboratory tests are plotted.

The tests were made on twelve samples 35 days old. Eleven of the samples were cylinders 6 inches in diameter and 12 inches high (nominal dimensions) and one sample was a block with dimensions of 5⅜ by 5⅜ by 10¼ inches. The unit weight and unit compressive strength of the twelve samples are given in the following tabulation:

A Bubblestone apartment building under construction at Pacific Grove, California

The Del Monte School District School at Monterey County, near Monterey, California, being constructed of the new Bubblestone masonry units

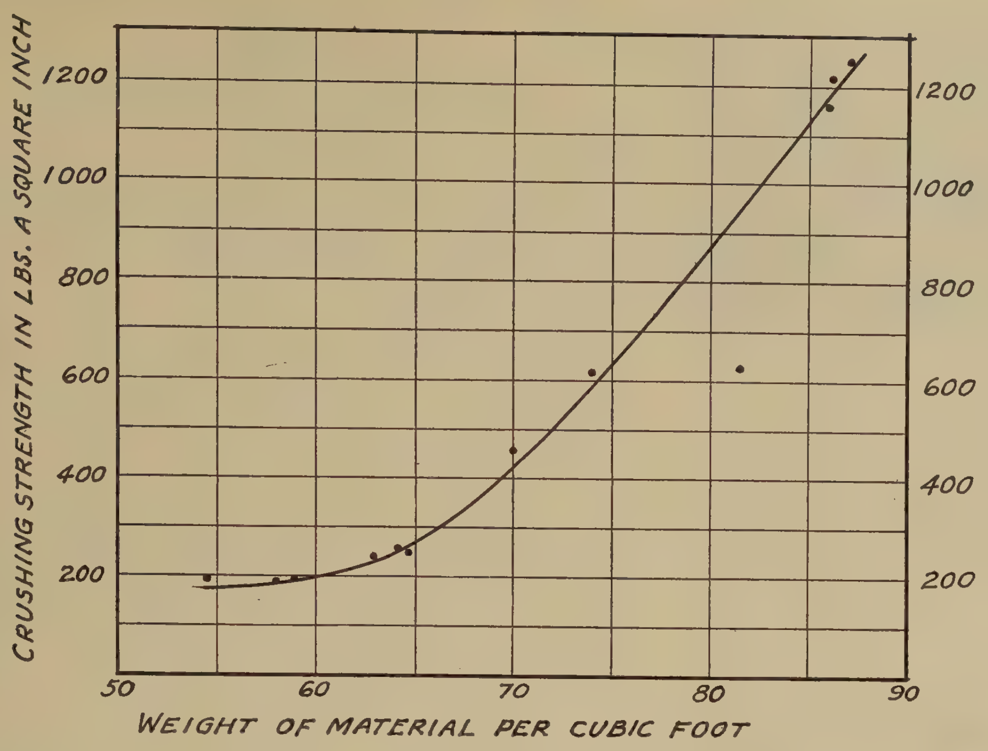


Figure 1

Weight per cubic foot in lbs.	Crushing strength, lbs. per sq. in.
Block	
54.5	197
Cylinders	
57.9	192
58.8	197
62.8	240
64.3	260
64.7	251
69.9	459
73.9	617
81.5	628
86.1	1161
86.4	1219
87.3	1254

Units intended for partition work or other locations where the load is light ordinarily are made of material weighing about 65 pounds a cubic foot. For heavier work units of a somewhat heavier material are used. Thus far the Bubblestone units intended for bearing walls have been used only in one-story buildings.

Manufacturing Methods

The building units are made by mixing a stiff portland cement mortar with proportions of about one part of cement to 2½ parts of sand, to which air cells, as described below, are added. The consistency of the mortar is about the same as for stucco work.

The air cells, in the form in which they are added to the mortar, have the appearance of the beaten white-of-an-egg. The air-cell material is sold in the form of a liquid compound, to which 40 or 50 parts of water are added. This diluted solution then is passed through a beating machine. During the beating process air is pumped through the machine and into the liquid. This machine has been developed by the Monterey Bubblestone Company for use in its own manufacturing process. The machine, at present, is not on the market.

Detail view of house under construction at Pacific Grove, Calif., showing steel reinforcement in place

A school at Seaside, Calif., employing Bubblestone masonry units nears completion

As a result of the introduction of air during the beating process the air-cell material consists of films over an infinite number of small air pockets. This beaten cell material is now mixed with the sand-and-cement mortar, and becomes incorporated in the mortar. Even if the film of an individual cell is ruptured the air contained in the cell still remains in the mixture, and a minute air pocket is created.

The final product is a concrete containing an infinite number of small individual air cells, a structure having excellent insulating value.

The completed California apartment building, after application of stucco

The cellular structure also forms a good key for plaster or stucco. Nails can be driven into it. The grip of nails decreases as the density decreases. The material can be sawed with an ordinary cross-cut saw.

The units are formed with longitudinal grooves on the horizontal surface, into which steel reinforcement is placed at every course. The joint is then filled with 1:3 cement or cement-lime mortar, the reinforcing bars being embedded in the mortar.

Some of the buildings in which this material is used include a one-story apartment building in Pacific Grove, Calif., a one-story school building at Seaside, Calif., and a one-story school building in the Del Monte school district in Monterey County, Calif. These three buildings, together with a number of single-family dwelling-houses in Monterey and vicinity, were built in 1927.

Road Show at Kansas Covers Southwest Territory

Preparations are continuing for the third annual Southwest Road Show and School to be held at Wichita, Kansas, for four days beginning February 21st. An instructive school program will be given.

American Road Builders Meet in Cleveland

Spacious Auditorium Permits Good Exhibits

Twenty-five years ago a group of five men met and founded the American Road Builders Association. From January 9 to 13, 1928, this same organization met at Cleveland for its Twenty-fifth Annual Convention and Exposition.

But what a change!

The recent twenty-fifth meeting dominated the activities of a city even as great as Cleveland. The more than 20,000 road builders who attended thronged the hotels, spending their days either at the Public Auditorium where the machinery exhibits were housed or at the Hollenden Hotel, where the program sessions were held.

The Public Auditorium, with its two floors of exhibition space, was not large enough to hold the equipment assembled by the more than 300 exhibitors. Equipment displays filled the auxiliary, one-story building known as the west wing and spread over into the Armory across the street and into the vacant lots nearby. It was estimated that the equipment displayed exceeded $3,000,000 in value.

Many exhibitors expressed themselves as being pleased with the larger and better exhibition facilities offered at Cleveland. Such drastic reductions in the space applied for as was necessary in the old Coliseum at Chicago were not necessary here, because of the greater amount of space available.

The convention opened on Tuesday morning, January 10th, with a general session, attended by both the contractors and engineers. As was the case in the previous convention, some of the sessions were divided into two groups—the constructors and the engineers. This was the case for the Tuesday afternoon and Wednesday sessions, the convention closing with a general session devoted to the interests of county highway officials. The Pan-American session was held Wednesday morning.

A paper presented at the engineers' session on Tuesday afternoon was of particular interest from the standpoint of concrete highway construction. During that session, R. G. Giles, chief engineer of concrete control for the Blaw-Knox Company, read a paper entitled, "Measuring Materials for Concrete." R. W. Crum of the Iowa Highway Department followed with a discussion of his experiences in measuring concrete materials by weight.

An interesting discussion regarding the experiences of the engineers present revolved around the various methods used in the states and counties represented to control the quality of the concrete going into the pavements. The discussion emphasized the statement made in the highway review published in the January issue of this magazine, that the subject of quality control of concrete is receiving the interested attention of highway engineers everywhere.

The Road Builders' annual banquet was held in the Grand Ballroom of the Hollenden Hotel on Wednesday evening, January 11th. With more than 20,000 visitors, the committee in charge of the banquet had a difficult time, considering that only approximately 1,000 people could be accommodated at the banquet.

Each year it seems as if it were impossible to have a larger or more successful Road Show, and yet, each year that very thing happens. Every visitor, whether he came to attend the sessions, to see highway building equipment, or to meet and visit with his associates in the work in other sections of the country, found that he could gratify his ambitions and thus make his visit to the Twenty-fifth Annual Road Show and Exposition worth while.

America's Tallest Reinforced Concrete Building

Design of Master Printers' Building in New York Involves Many Interesting Features—Is 301 Feet High—Flat Slab Construction Used — Combination of Reinforced Concrete and Steel in the Columns

By W. W. HAY

THE tallest reinforced concrete building yet constructed is the eighteen story Master Printers' Building in New York City, occupying the block front on Tenth Avenue, between 34th Street and 33rd Street, it being 301 feet from the low point of the basement to the platform supporting the sprinkler tank. There are a number of other points of interest about this building, besides the height, such as the use of flat slab floor construction, designed for a live load of 250 lbs. per sq. ft., the use of steel columns in the lower floors, and the development of setbacks.

The building occupies a site facing 197 ft. 6 in. on Tenth Avenue, with a depth of 175 ft. 8 in. on one street and 171 ft. 3 in. on the other, an area of over 33,000 sq. ft. A private driveway has been provided from street to street, along the rear of the building, so that the building above grade measures 150 ft. 0 in. on both street frontages. It is 18 stories and basement, with two penthouse floors, the total height from the low point of the sidewalk to the top roof slab being 281 feet. The columns are spaced 19 ft. 9 in. along the avenue by 18 ft. 9 in. along the streets and the floor slabs are 8¼ in. thick with monolithic finish. The floor heights are, basement 13 ft. 6 in., first floor 18 ft. 0 in., typical floors 13 ft. 6 in., and penthouses 13 ft. 0 in. Ample elevator facilities are provided by six passenger elevators, four combination elevators of 4000 pounds capacity, and two freight elevators of 6000 pounds capacity. An inside platform and covered driveway provides space for fifteen trucks to load and unload adjacent to the freight elevators.

Flat Slab Floor Construction

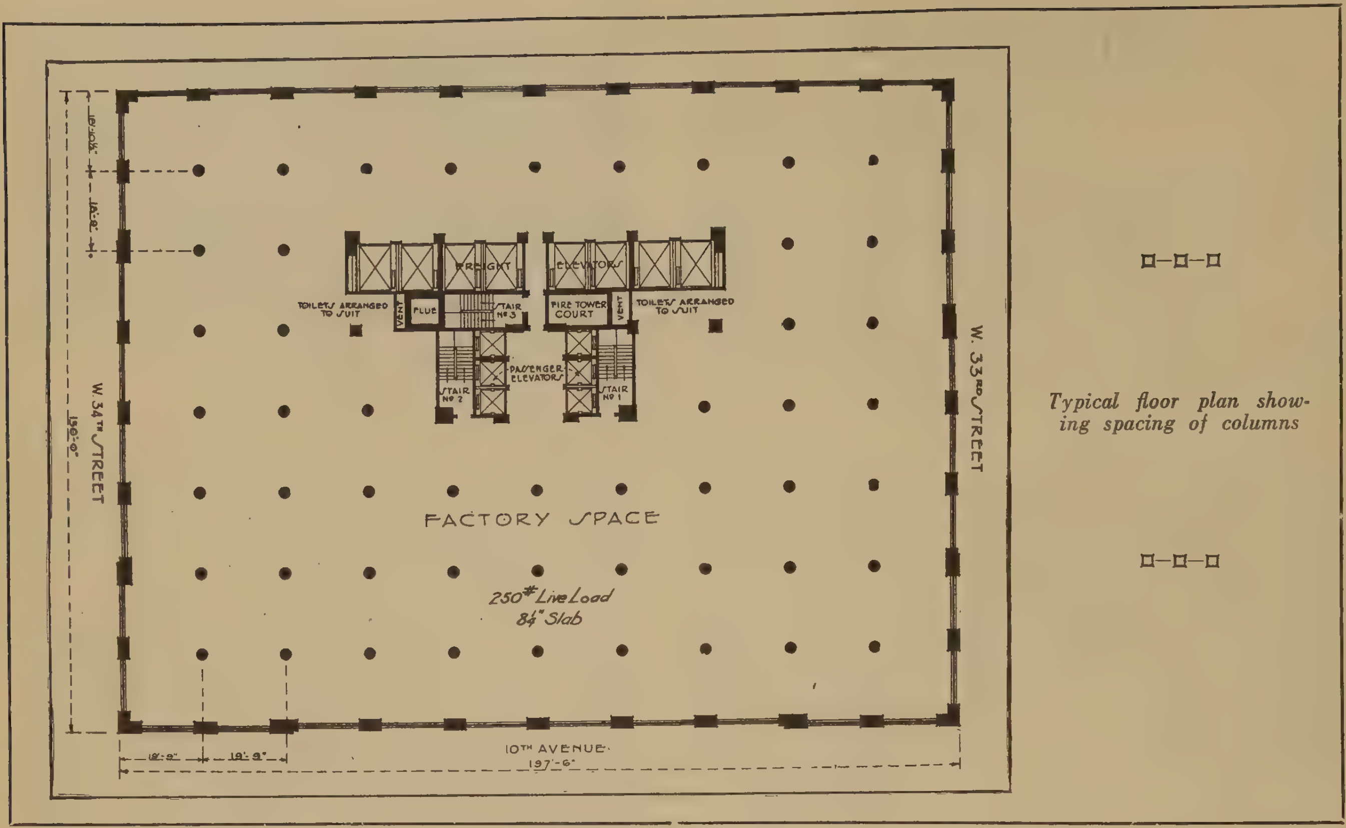
The building was designed for occupancy by printers and allied trades, who require heavy construction and ample natural light, and it houses in one building everything necessary to complete any job of printing. The top floor is occupied by the Printing Crafts Club.

The use of flat slab floor construction was rare in a building of this height, but there were many reasons why it would be satisfactory, and many more reasons why it would be more desirable. The spacing of the columns provides a minimum clear distance between shafts of 16 ft. 3 in. on the ten lower floors, sufficient to accommodate all except the largest rotary presses; the flare of the column heads and the drop panels in a bay of these dimensions provides a relatively deep floor slab of comparatively short span, which, with the disposition and inertia of the mass, results in practical elimination of both vibration and noises. There is almost no obstruction to light, the location of line shafting, monorail tracks, and other overhead work is a matter solely of convenience, and the expense of sprinklers, wiring, painting, and other items is reduced.

Column Design

The New York Building Code, in effect, has made possible this piling of story upon story of such heavy construction, since it permits a reduction of live load from the upper floors to 50 per cent in the lower floors, and also allows the use of structural steel to carry the entire load with a unit stress of 16,000 lbs. per sq. in., so that the interior columns have a maximum diameter of 34

The Master Printers Building in New York, 301 feet high, takes rank as the tallest reinforced concrete building in the United States



Typical floor plan showing spacing of columns

inches for concrete spiralled shafts, and only 30 inches where the steel core is used in the lower ten floors and basement.

The load on a typical interior column is 2,100,000 pounds, the maximum through column load is 2,760,000 pounds, and the maximum load on any column is 5,341,000 pounds on each of two columns carrying plate girders over the loading platform and is equivalent to the load of two exterior columns and one interior column.

The foundations are in solid rock, distribution of these loads being accomplished by steel grillages and billets. In general, the structural-steel cores are 14 in. H-columns, the section being increased first by weights, then by the addition of 10 in. plates to both sides of the web until the limit of thickness for rivetting is reached, after which cover plates are added to both faces of the section.

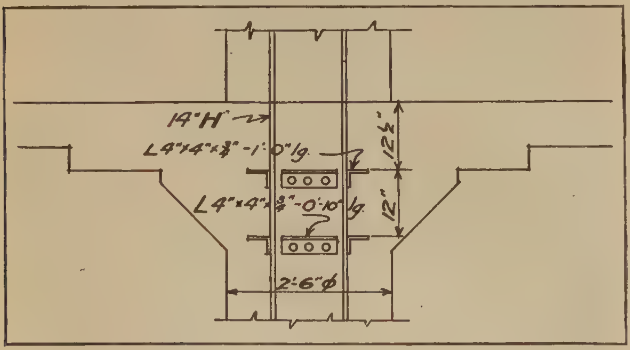


Figure 1

The expense of retaining a gang of erectors, derrick men, and others, while awaiting the concreting of floors has led to the fabrication of these cores in maximum lengths, usually 4 floors, and after plumbing and bracing at the top with steel framework, the erection gang is drawn off to other jobs until the concreting advances. Shelf angles are used to take care of the shear between the floor slab and the steel column core. (Figure 1.) Steel billets are used to cap the cores, and were designed as though the steel core were inverted and loaded with the load carried by the core. These billets have sides equal to that of the diameter of the concrete shaft above.

Setback Provisions

The requirements for this Zone Area required setbacks to be made, and as appears from the photograph, the first setback, 18 ft. 6 in., starts at the 11th floor, and there are further setbacks in the same facade of 18 ft. 2 in. and of 14 ft. 1 in. at various levels, depending upon the width of the facing street and height above the ground floor. As far as is known, this building represents the first development of the setback in a flat slab floor system, and it has since been used freely in many buildings in New York.

Winter Concreting

The Master Printers' Building encloses a total of about 7,700,000 cubic feet, and has a building area of about 550,000 square feet, of which some 530,000 sq. ft. are available for leasing. Clearing of the site commenced during the summer of 1926, and concreting was carried on throughout the winter months, the floors being enclosed with tarpaulins and heated with salamanders. There are a total of more than 23,500 cubic yards of concrete, 2000 tons of reinforcing steel, and 2100 tons of structural steel in the structure. It was completed during the summer of 1927 and tenants were occupying the lower floors before the top floors were finished. The building cost about $3,000,000, and the entire property has been financed by a 6½ per cent 1st mortgage loan of $2,800,000. The owners are the Kymson Building Corp., Mr. Jacob Monsky, president; the general contractor was R. W. Smith & Co.; and the architect was Frank S. Parker, all of New York.

Distinctive Block Made With Own Design of Equipment

"Eyblock" Is the Trade Name of a Wet Cast Block Made in New York Plant—Products Manufacturer Designed His Own Equipment and Method of Manufacture—Wide Variety of Facings Possible—Types of Block Made—Manufacturing Methods—Interesting Plant Layout—Yard Storage Methods—Costs—Merchandising Methods Used

By VICTOR EY

IN the last decade the concrete block industry has made many strides forward in the manner of manufacture and the quality of the material in the finished product but has neglected the design of the product itself. The design of the block of twenty years ago is practically the same as the one of today. Compare the automobile and its manner of manufacture of twenty years ago with the one of today and you will certainly note that not only the method of manufacture but the product itself has made great strides forward.

A 216- by 96-foot warehouse made of Eyblock

I am of the belief that the concrete block of the right design, made of the proper materials and by the right process of manufacture is the best of all masonry materials. With this belief in mind, my dad and I started six years ago to investigate the concrete block field with a view to entering the industry. After months of investigation and experimenting we set out to design a unit and a process to manufacture it. This required a good deal of study and research work.

The unit we decided upon has the following qualities: It produces a wall that is absolutely dry, fireproof, heat insulating, of super-strength, permanently beautiful, low in first cost, and with no maintenance cost. In practice we have found that buildings built entirely of our block have given the owner a better building for less money than any other material.

Manufacturing Method

As to the process of manufacture, we have a simple system that gives us the maximum strength of the concrete to be used in the unit. A simple type of equipment is used to make this unit, the equipment having a very low rate of depreciation.

Design

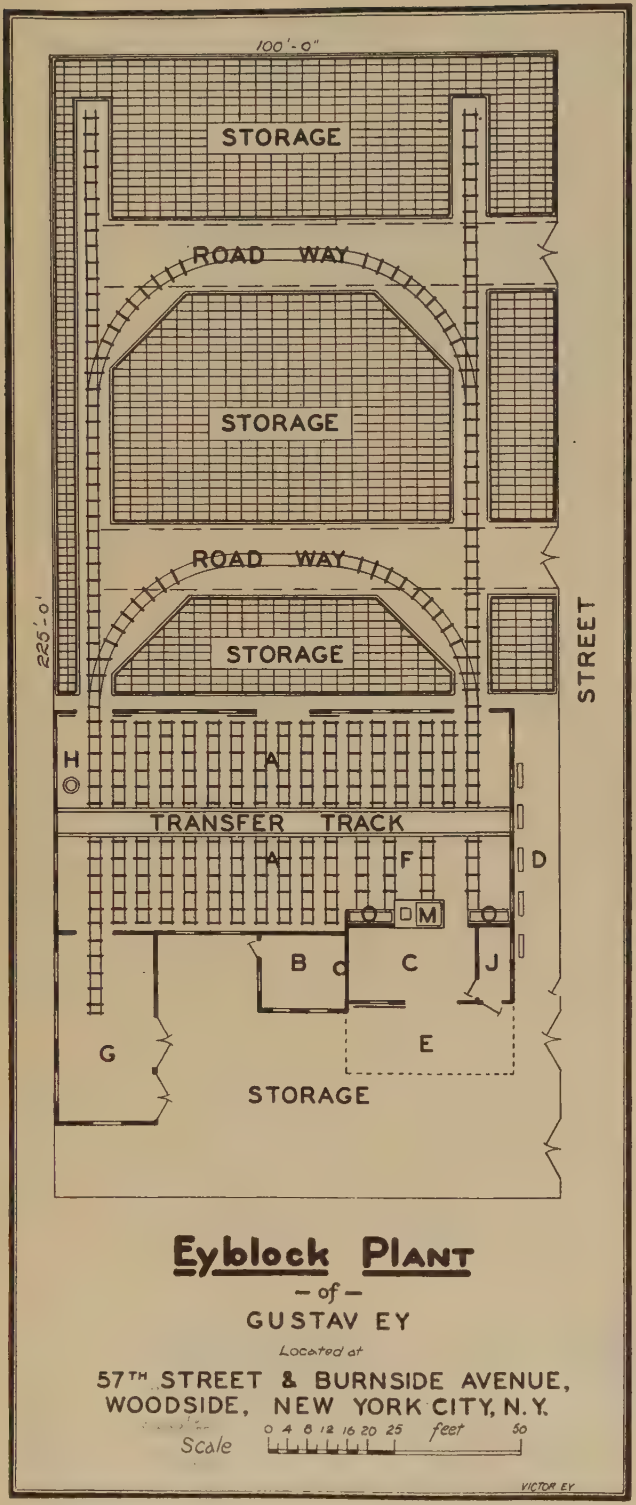
The details of our block are as follows: They have no cores. There are grooves around the perimeter, the grooves at the end of the block being larger than those on top and bottom. This feature provides ample room for the hands to obtain a perfect grip. This makes the block easy to handle both in process of manufacture and in laying them in a wall. The grooves in the block also allow for the use of steel angles for lintels over wall openings without cutting the block as well as for cutting the block when certain conditions in construction are to be met in the field. They also produce a wall that has a horizontal and vertical venting, a very much desired feature in building construction. The building trade, which is prejudiced against large building units in general, has received our block favorably.

The different types of block which we manufacture all involve the groove idea. We have blocks that take care of almost any condition that might arise in a building. Our line consists of 8- by 8- by 16-inch and 8- by 12- by 16-inch standard block, corner block, beam block and jamb block for either steel or wood frames.

Variety of Facings

We consider the block we manufacture ideal for use in

A 6-room Eyblock residence. The design is very simple, yet attractive. The owner says it costs 40 per cent less to heat this house than it does a frame house of the same design



The plant layout

above grade construction, and therefore make them with many attractive facings, such as the many types of stucco, pebble dash, limestone, granite, onyx, marble finishes, Karamiksized, etc. This gives us a complete line of facings to meet any taste or architectural requirement. Many of our facings are finished on a rubbing bed or polishing machine. With these machined facings we can match any artificial cast trim stone.

Wet Cast Method Used

The manufacture of our block is by the pouring method. This system we believe produces a very strong block with an attractive appearance at a low rate of equipment depreciation. The pouring method also reduces sales resistance from the standpoint of the architect and builder who are familiar with poured concrete.

The molds we use are of our own design. They are made entirely of sheet metal, electrically welded. Depreciation is reduced to a minimum. A unit of thirty molds is placed on a roller bearing car, the car operating on 24-inch gauge tracks. The design of the molds is such that all surplus material from previous pourings which would cause misalignment is removed on assembly. Butt joints are used on all the points of contact in the molds. The mold is designed for use with a minimum number of parts to produce the maximum number of blocks. All parts of the mold are of rigid design with no collapsible cores or pieces. There is no overlapping, thus making it very easy to assemble and dismantle.

We produce our complete line of blocks in two types of molds with very inexpensive attachments. All the parts are interchangeable so that if by misuse or accident they are removed from service, they can be replaced by new ones without fitting or adjustment.

Plant Arrangement

The manufacturing process of our blocks is as follows: Sand and gravel of the best quality are mixed with cement in proportions of 1:2½:4, in a non-tilting type drum mixer. The mix is allowed to run two and one-half minutes. This mixing time we have determined by experiment to be the best considering strength and workability. The concrete is then placed into the mold car which is directly under the mixer. The newly cast block are then removed to the storage shed until the following day where the green blocks are protected from drafts and the weather. The temperature of the shed is kept at about 80 deg. F. at all times. We use no live steam for curing.

When the mold car is removed from the storage shed it is taken to the storage yard where it is dismantled. The car is then returned to the oiling room, where all molds are given a thorough oil bath, and placed on racks to drain. The mold is then ready to be re-assembled for the next pouring.

Very little skill and no tools are required in assembling or removing block while dismantling car. The design of the block allows for immediate stockpiling.

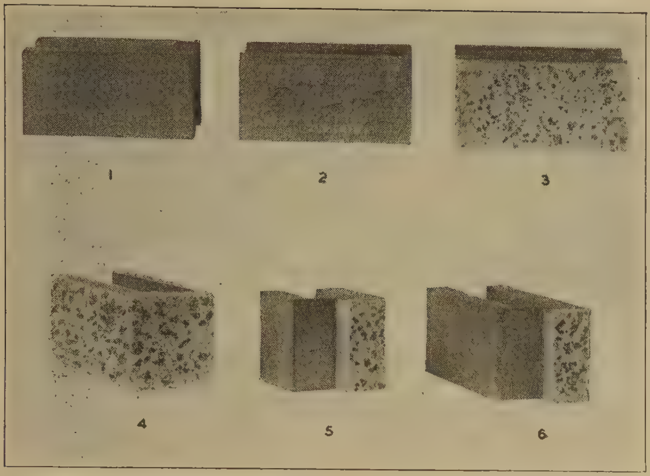
An accompanying diagram shows the layout of the plant, the various lettered locations being used as follows:

A—Mold car storage—70 car capacity.
B—Boiler room and machine shop boiler for heat only.
C—Cement storage.
D—Sample display.
E—Sand and gravel storage under roof.
F—Pouring room.
G—Garage and mold room.
H—Grinding machines, for machine facing of blocks.
J—Office.
M—Mixer.
O—Oiling tanks and racks, for dipping of the molds.

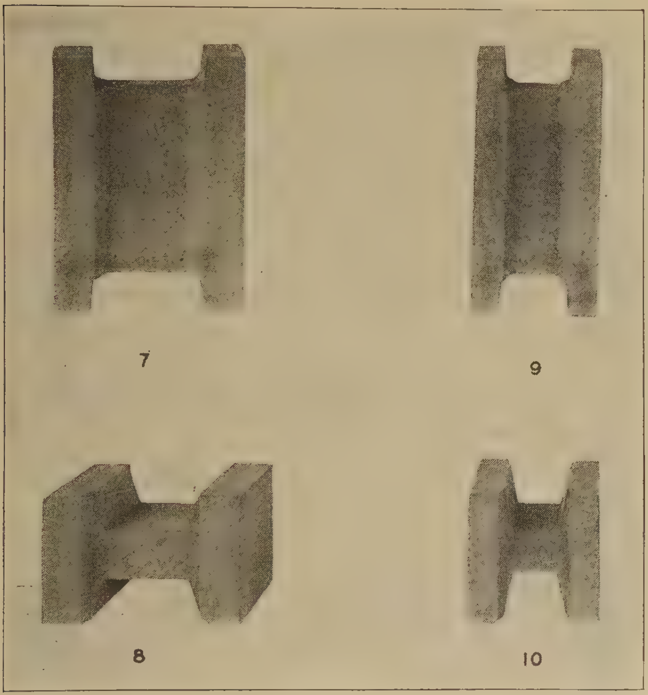
Storage Facilities

Our storage yard is so planned that we obtain the maximum storage space per square foot of yard. No block has to be transported more than an average of 30 feet from the time it is taken out of the mold cars until it is placed on a truck for delivery. On special block the storage piles are covered with tarpaulins to protect from the sun.

The storage yard has a capacity of about 50,000 block in piles 8 block high.

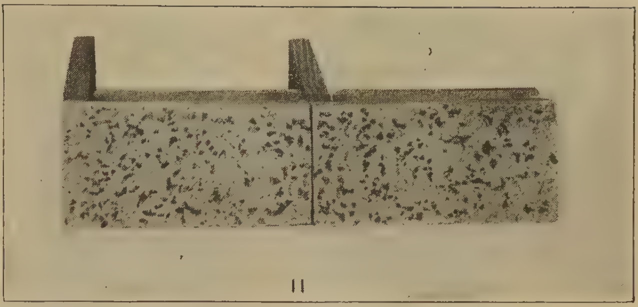


1—Plain faced standard block
2—Grey stucco faced standard block
3—Pebble dashed standard block
4—Pebble dashed corner block
5—Half jamb block
6—Full jamb block

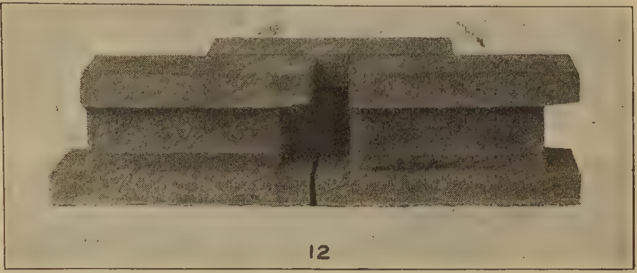


7—Top view of 8-inch block
8—End view of 8-inch block
9—Top view of 12-inch block
10—End view of 12-inch block

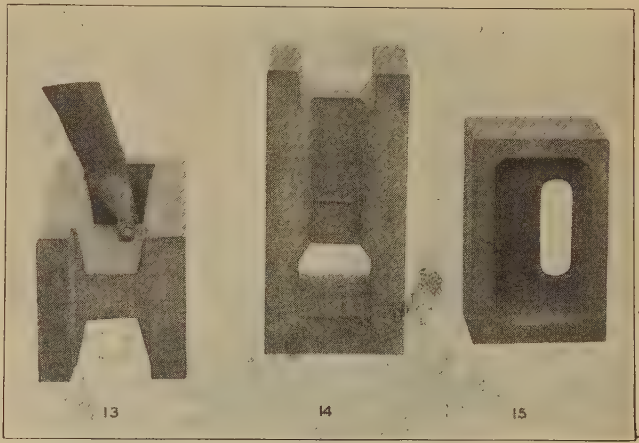
After much study and experimenting on our trucking problem we have come to the conclusion that the truck that hauls the most block in perfect condition for the least amount of money is a truck of the bus type with pneumatic tire equipment. The bus type was chosen because of its low platform height from the ground. The truck should have a capacity of 6½ tons and haul its load at the rate of 22 miles per hour on hard surfaced road. With this type of truck we have hauled all our block in the past year, and have not had a broken block. The maintenance cost of these trucks has been less than on any other type tried. We guarantee our blocks delivered on the job in perfect condition.



11—Type of beam construction in an Eyblock wall



12—Top view of a beam course. Provision is made for 2-inch beams. For 4-inch beams, both ends are cut off



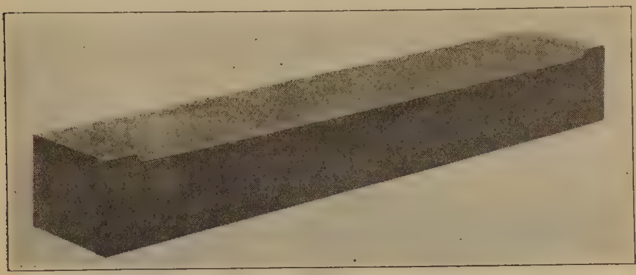
13-14—Shows grip in a corner block. When additional strength is required, reinforcing can be placed through the opening of the entire height of the course

15—The 5- by 8- by 12-inch Eytile. It is perfectly balanced and can be picked up from either side because the grip is in the center of the tile

Merchandising

As to merchandising our products, we started by giving them the trade name "Eyblock, the Perfect Building Unit." This name is always displayed in our own style of type and has come to mean to the architect and builder of our locality just what it implies. The shape of our block is so different from the average block that it gives us a chance for a lot of effective sales arguments. The result is that sometimes we are able to make a sale where the use of block was not even considered. There are many builders who use nothing but our block and there are many specifications where Eyblock are called for exclusively.

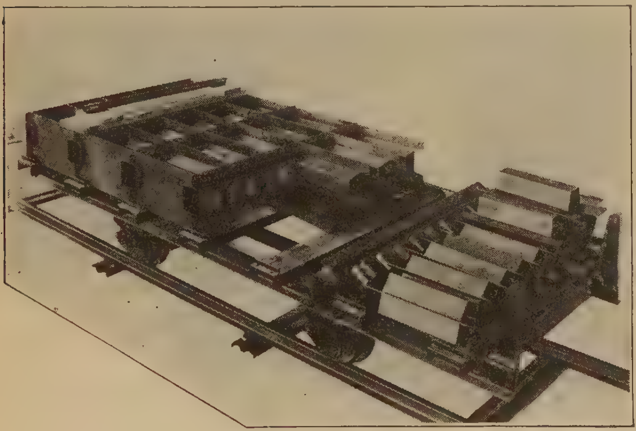
We have resorted to highway billboards and newspapers for advertising. We use special folders of our own design for mailing purposes or to be given to the trade. We make use of building expositions and kindred lines to display our block. In the last exposition our booth won the prize offered by the Queensborough Chamber of Commerce for the best display by a vote of four to one. This in spite of the fact that public utility com panies and national advertisers with hundreds of thousands of dollars available for advertising display, did their best. Yet it was possible for us to display our block in a four-wall booth with a fireplace in a way that won this prize. There were no outside trimmings in the booth so that the block itself must certainly have been attractive. All blocks used were taken from stock. This exposition has brought us many new customers and prospects, and proves the worth of advertising attractive and practical concrete products.



Window sill with lugs, also cast in the Eyblock plant. Other designs of sills and lintels can be made

Costs

The market price for concrete block in our district averages about 13 cents for an 8-inch plain block and 21 cents for the plain 12-inch block. These are delivered-on-the-job prices. Compare these with our prices of 23 cents for an 8-inch plain block and 33 cents for the 12-inch plain block. For the faced block we get from 38 cents to $2.25 per block. All of our prices are quoted f. o. b. our yard. In some instances we have received as much as 15 cents per block cartage.



The molds, partly dismantled

Aggregate

We buy every yard of sand and gravel used from a plant that is equipped to wash all the material. This plant is considered the best in New York City for they deal only in the highest grades of sand and gravel. We pay $1.90 per cubic yard of sand and $2.75 per cubic yard of gravel. Our cement costs $2.85 per barrel net. With these prices for material, we can manufacture an 8-inch plain block for 13¼ cents and the 12-inch block for 16½ cents. These prices include all labor and overhead. The faced block require the same equipment and the only extra costs over the plain block are for labor and material. The faced blocks permit the making of a larger profit and at the same time they are the block that give real advertising at no cost.

Co-operation

It is our desire to co-operate in every way possible in the future development of the concrete products industry as a whole, and we stand ready to be called upon at any time to give the benefit of our experience to any project which has for its purpose the establishment of this industry on the plane that it deserves.

Bureau Looks into Specifying of Precast Stone

Tests have been started at the Bureau of Standards to determine the physical properties of precast stone with the object of preparing federal specifications for this material. Samples were obtained from various manufacturers scattered throughout the United States giving 17 different varieties or types of stone. The preliminary tests decided upon were compressive strength of wet and dry specimens, modulus of rupture, modulus of elasticity, rate of absorption, porosity, and ability to resist weathering.

The following are the methods used and the results obtained:

1. Because of the various shapes into which precast stone may be molded, the advisability as to the size of the specimens was taken into consideration and a comparison was made of the compressive strengths of cylinders 2 inches in diameter, 4 inches long; cylinders 2 inches in diameter, 2 inches long; and cylinders 1 inch in diameter, 2 inches long. It was found that the compressive strength as shown by the cylinders 2 inches in diameter, 4 inches long ranged from 3,200 to 8,200 lbs./in.^{2}; that the 2 by 2 inch cylinders gave a strength varying from 5,640 to 9,400 lbs./in.^{2}; while the 1 by 2 inch cylinders were approximately 8 per cent lower in strength than the 2 by 4 inch cylinders.

2. Modulus of rupture as determined by tests on 1 by 1 by 8 inch prisms gave results that vary from 900 to 1,500 lbs./in.^{2}

3. The modulus of elasticity as determined by means of the Tuckerman strain gauge on the cylinder 2 inches in diameter 4 inches long gave values ranging from 1,000,000 to 3,000,000 lbs./in.^{2}

4. To determine the per cent absorption of water the specimens were dried at 110 deg. C. until their weight became constant, this usually requiring about 72 hours. The specimens were then immersed in water and taken out at intervals, the surplus water removed with a towel, and weighed. The increase in weight expressed as percentage of the dry weight was recorded as the absorption. The per cent absorbed at the end of 48 hours varied from 4.54 to 7.78. Upon boiling the specimens three hours an increase of from 5 to 150 per cent over 48-hour cold-water absorption was noted.

5. The porosity was determined, assuming that all the pores were filled after three hours boiling, by using the following formula:

$$\text{Per Cent Porosity} = \frac{\text{Weight (after 3 hours boiling)} - \text{weight dry}}{\text{Weight (after 3 hours boiling)} - \text{weight suspended in water}} \times 100$$

6. Freezing and thawing weathering tests are now in progress. Eighteen cycles have been completed to date without any appreciable disintegration.

The Application of Reinforced Concrete to Structures*

A Discussion of the Present-Day Trends in the Uses of Reinforced Concrete in Structures—Concrete in Competition with Other Building Materials—Developments in Construction Methods—Discussion of Scope of Usefulness of Reinforced Concrete—Combination Steel and Concrete Structures

By WM. F. ZABRISKIE
Vice-President and General Manager, Gabriel Steel Co., Detroit

THE problem of the designer of the modern structure is becoming increasingly complicated as compared with the conditions of former years. Briefly stated, the problem is to give his client, the owner, a structure adapted as perfectly as possible to his needs and at the same time combining strength, fire-safety, speed of construction, and economy. The problem has not altered since the introduction of fireproof construction into building work, but the factors attending its solution are becoming more complex as the science of structural design is further developed. Not only are the modern structures becoming more complex in their requirements, but the range of application of materials has been increased and the conscientious designer is forced to make comparisons between several possible types of construction.

The New Competition

This has been spoken of as the "Age of Competition." It is surely so in all lines, and in addition to the competition between companies or individuals supplying the same materials or service, a new form of competition has arisen between industries and materials. The designer is besieged with advertising propaganda setting forth the particular merits in building construction of brick, stone, lumber, structural steel, reinforced concrete and many other materials. All of these advertisements point out the merits of their particular materials, and without doubt all of these materials have merit. The intelligent and competent designer must be the judge and jury to decide for his client which of these various materials best suits the solution of his problem.

> ***"Practically all of the just criticism of concrete as a construction material has been brought about by defects directly traceable to lack of field control. If we are to believe in this material and are to expect an increase in its use, we must pledge ourselves to an earnest endeavor to see that all factors affecting this material in the field are properly controlled."***

It is an old and true saying that "Comparisons are odious." In this matter, however, to the designer of a modern structure they are necessary and he must weigh the relative merits and defects of each material as it may be applied in the solution of his particular problem. It will be the aim of this address to present a few facts which have been drawn from my experience which may assist the designer in an intelligent selection of reinforced concrete as a material. It will be my aim to point out the type of structure in which it appears especially desirable and also the type of structure in which it may be very properly considered as an alternative to other types of construction. Since I am personally engaged in the supplying of reinforcing material for reinforced concrete construction, I can be very properly accused of a biased point of view. I will, however, sincerely attempt to avoid any such bias in these remarks.

A New Building Material

Of the principal building materials now in use, reinforced concrete is one of the newest. During the period of development engineers' ideas of the proper way to construct reinforced concrete have changed materially. In the matter of design, the art has progressed through various stages. One of the most interesting phases was the "System Period," when special proprietary types of reinforcement and methods of construction were promoted on a competitive basis. While some of these methods have been discarded as impractical, other methods have proven very successful and have been retained and improved. Types of design have now become largely standardized and much has been accomplished in the way of unifying the requirements of building codes, unit stresses, etc.

Construction Progress

Construction methods have also radically changed. In this country American inventive genius working along the lines of quantity production brought about vastly more economical methods for handling and placing concrete. While this, no doubt, gave great impetus to the growth of the industry, it also brought with it one of the worst abuses from which the industry has suffered: i. e., the use of excess mixing water, which was considered essential to facilitate the more rapid handling and placing of the material.

It would be appropriate, I believe, before considering the application of reinforced concrete to structures to review briefly its properties and to point out both its advantages and defects as a construction material. Its advantages are generally well known and may be summarized as follows: adaptability, fire-resistance, and economy. Probably no material is more readily adapted to different forms of construction. The very nature of the material which can be molded or formed in any desired shape adapts it conveniently to use where other materials can be used only with great difficulty. Probably no construction material is equally fire-resistant as reinforced concrete. Not only is it resistant to high temperatures, but if proper care is taken in the selection of aggregates it is also resistant when hot to the action of cold water. These points of advantage will be more particularly discussed when the different types of construction are considered.

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*A paper presented at the annual meeting of the Michigan Engineering Society, Jackson, Mich., Nov. 11, 1927.

Wide Scope of Usefulness

In which type of structure is reinforced concrete especially applicable? One of the advantages of this material is its adaptability and nowhere is this better illustrated than in the problem of the design of foundations. The modern structural engineer would certainly be sadly handicapped in his work if he were deprived of plain or reinforced concrete as a foundation material.

The United Artists' Building, an 18-story office building structure with a composite frame. The lower six stories of this building were built of structural steel. The upper twelve are of reinforced concrete

The fact that reinforced concrete can be rapidly, conveniently and economically placed in any excavation makes it equally adaptable to caisson piers, spread footings, combined footings or mat foundations. The fact that it can be reinforced against flexure in two or more directions by utilizing principal stresses at right angles to one another makes it possible to design spread footings and combined footings of a very shallow depth. When proper consideration is given to impermeability and the proper concrete mix, reinforced concrete footings can be considered absolutely permanent in practically any type of soil.

These considerations have resulted in reinforced concrete very largely displacing the use of combined plate girders and grillage foundations which had previously been used for combined footings. It is important, however, to remember in the design of such combined footings that heavy shears are frequently encountered and this consideration will frequently be the limiting factor in determining the size of the reinforced concrete member. I can recall several such designs where limitations on the size of the concrete member made it desirable to introduce some structural steel because it was not practicable to carry the high shears in the limited space limits available for the reinforced concrete members. These cases, however, are exceptional and in general it is usually possible to satisfactorily solve these problems and adhere to conservative design values.

The next large field of application for this material is in floor and roof panels, either in connection with reinforced concrete frames or structural steel frames. Here again reinforced concrete has so demonstrated its superiority that it has practically displaced other systems of floor construction.

In the earlier period of its use, the heavy dead load resulting from solid concrete slabs was considered a serious disqualification for their use on long spans. This problem has been very satisfactorily solved by the introduction of systems of reinforced concrete in combination with terra cotta tile and by the introduction of the various types of ribbed concrete slabs. These ribbed concrete slabs in which the centering is generally supplied by removable metal floor forms, can be placed with great rapidity and in placing the concrete floor slab it is possible to combine in one operation the installation of the floor and the fireproofing of the structural supporting beams.

In the past year one large office building was built in Detroit in which these floors were installed as rapidly as at the rate of one floor per day covering an area of approximately 10,000 square feet, or an area one hundred feet square. It should be borne in mind, of course, that work was proceeding on several layers simultaneously but that the floors were actually constructed at the rate referred to.

One admirable feature of the use of reinforced concrete for the floor systems of buildings lies in the fact that due to its monolithic nature and its reinforcement generally in two directions, it forms an excellent system of bracing at each level for the frame of the building and a generally adequate method for distributing wind shears to points of the frame where provision is made for carrying these wind loads to the ground.

Long Span Girders

As experience with the material has given the designers more confidence and as more complete engineering data has become available as to the analysis of such members, concrete is being used at a rapidly increasing rate for long span girders over garages, theater roofs and any space requiring long and unobstructed clear spans. The application of reinforced concrete to such long spans is, in my opinion, limited largely by the practical considerations of dead load and the limitations of shear at the end of the girder. This limitation of shearing resistance will frequently determine the designer in favor of structural steel as against reinforced concrete in the case where a girder has to carry heavy concentrated loads as in the case where girders are used over large areas in the lower portion of a building to support columns extending through several stories above.

In connection with the use of long span reinforced concrete girders, the use of high strength concretes to provide increased bending and shear resistance is becoming more noticeable in recent designs, and it seems reasonable to expect that this tendency will continue in the future.

Industrial Buildings

The class of structures in which complete reinforced concrete construction has been used probably more extensively than any other is multi-story industrial structures of a limited number of stories. This is a field of construction for which reinforced concrete seems to be pre-eminently well suited and in which it can compete without price disadvantage generally against inferior and non-fireproof forms of construction.

With the introduction of the girderless flat slab type of floor construction, designers have been supplied with a type of industrial structure which is ideal from many considerations. The absence of beams permits excellent conditions of daylighting, maximum facility for installation of shafting and other overhead equipment, maximum head room for a fixed story height and many other similar advantages from the standpoint of planning. In addition, girderless flat slab floors when properly constructed and well reinforced are splendidly adapted to absorb vibration incident to moving machinery, and can probably stand more abuse from the standpoint of overloading than any other type of construction which has been devised. This type of structure is particularly applicable where live loads in excess of one hundred pounds per square foot are to be provided for, and where spans do not exceed from twenty-five to thirty feet. Multi-story warehouses may properly be classed with the structures which have just been described, although the conditions to be met are somewhat different than in industrial structures. The heavy loads and desirability of maximum head room make the girderless or flat slab type ideally adapted if it may be applied.

The Barlum Tower, a 40-story steel frame office building. The floors in this structure were completed at the average rate of one floor in a day and a half. The area of the structure was approximately 10,000 square feet. Ribbed slabs were built over removable metal forms

The Detroit Towers, a 19-story reinforced concrete frame apartment building of unusual design. Its extreme height and small ground area presented an unusual problem of wind bracing, which was successfully met

Another type of structure in which reinforced concrete has proved to be pre-eminently practical is in multi-story fireproof garage buildings. In this type of structure, the live loads are generally moderate although heavy concentrations from wheel loads must sometimes be provided for. Long span concrete construction has generally proved not only more practical but far more economical than any other type in this class of structures.

The Competitive Field

Between the type of structure described and the exceptionally tall building, there is a range of construction in which either structural steel frames or complete reinforced concrete frames might properly be considered as alternative constructions by the engineer. This overlapping fringe of the fields, as it may be described, offers opportunities for either type of structure and it is the problem of the individual engineer to decide for his client which type may be most advantageously used. The application of reinforced concrete to building frames has been a matter in which engineers have found it possible to extend the field considerably further than they had previously supposed to be practicable.

The extension of the use of reinforced concrete to the higher type of building within the past few years is probably indicative of a tendency which should continue to a still more marked extent in the future. The recognition by building authorities of the advances which have been made in the field control of concrete and in the production of concrete of high strength has resulted in higher design stresses commensurate with these advances in the art. Generally speaking, as I see it, reinforced concrete may be used to advantage up to that point in construction where the column sizes become objectionable on account of their interference with architectural features or intrusion upon valuable rentable floor space.

Combination Steel and Concrete Structures

It is not unusual in tall building design to encounter a demand on the part of the architect or owner for large clear spans on the ground floor of the building. In the case of office structures, this is frequently required over a banking chamber, or, in the case of a hotel, over its lobby, dining room or ballroom. As previously discussed, the high shears resulting from heavy concentrated loads in the structure above will frequently indicate to the designer the use of structural steel to solve these problems, but this does not necessarily mean that the entire structure should be structural steel. It has been found to be entirely practical to use structural steel in the lower stories of a structure and reinforced concrete in the upper floors, and in this way also to take advantage of the use of the small columns resulting from structural steel in the lower stories where the loads are maximum. The use of this composite construction seems to be becoming more marked in recent years, and I believe that its use will also tend to increase in the future.

Multi-story apartment buildings beyond the range of ordinary construction seem to offer a very logical and ideal field for the use of complete reinforced concrete frames. In these structures the spans are generally moderate. The live loads to be carried are very light and the frames are frequently more or less irregular, all of which seem to indicate reinforced concrete as the desirable and proper solution.

Choice of Material

In past years there has been much controversy between the proponents of reinforced concrete and the proponents of structural steel. I personally feel that this controversy has not only been unfortunate, but has been productive of no constructive advance in the art of building construction. The problem of the selection of the proper material which the designer faces is one not of personal preference or business interests, but one to be dictated by considerations of engineering adequacy and economy.

As may be properly inferred from the foregoing, you will probably conclude that I am thoroughly sold on the advantages of reinforced concrete as a construction material. And so I am, but I also feel that all advocates of this new and truly remarkable structural material should bear this very important fact in mind at all times: The qualifications of concrete as a construction material can be enhanced or retarded in direct proportion to its field control. Practically all of the just criticism of concrete as a construction material has been brought about by defects directly traceable to lack of this control. If we are to believe in this material and are to expect an increase in its use, we must pledge ourselves to an earnest endeavor to see that all factors affecting this material in the field are properly controlled.

The fact that reinforced concrete involves the assembling of several materials in the field and involves the question of workmanship in the placing of reinforcement and the proper mixing and placing of the concrete has been cited by its unfriendly critics as a valid reason for discouraging its use in important structures. As I see it, this contention is valid so long as field control is lacking. When field control is properly applied, I believe that reinforced concrete can be considered as reliable and accurate a form of field construction as any other, and work to this end is manifestly a duty of every engineer who is genuinely interested in its advancement.

Placing Concrete Under Water

When concrete must be placed under water, the work should be done in such a manner that the ingredients of the mix will not separate. Either a tremie must be used —that is, a large pipe through which the concrete is carried to a point near the bottom of the water; or large buckets with hinged bottoms, that can be lowered and from which the concrete can be dumped with least disturbance.

When a tremie is used, the pipe is gradually withdrawn and thus moved upward and the mass of concrete deposited is increased. The best results are obtained by mixing the concrete moderately dry, although when depositing by means of a pipe or chute, the concrete is often mixed very dry. The difficulty often encountered in placing concrete under water usually results from lack of care to prevent separation of materials. If the concrete is thrown into the water or even allowed to settle through it, separation of materials is unavoidable.

One common and inexpensive method is to provide a closed rectangular wood chute or a circular metal one. This is placed with one end extending into the water and to the foundation in such a manner as to prevent the concrete from flowing out while the chute is being filled. When entirely filled, it is raised slightly, thereby permitting the concrete to gradually distribute itself and at the same time permitting additional concrete to be placed in the chute, so that at no time can water enter.

In extensive work, a closed bucket with hinged bottom is often used. In some cases concrete has been placed under water in coarse jute sacks which were lowered to the bottom of the foundation. This method, however, is not dependable since frequently there is poor bond between different parts of the foundation. When the concrete is to be deposited from a water-tight receptacle lowered into the water, it should be mixed dry enough so that when the gate or trap door of the bucket is opened, the material will be discharged in a mass.

Cofferdams should be sufficiently tight to prevent current of water passing through the sheet piling. The surface of the concrete deposited must be kept as nearly level as possible to avoid the formation of pockets which will retain laitance and sediment. If concrete is not deposited continuously, all sediment and laitance should be removed from the surface of the concrete before concreting is resumed. No mixture leaner than 1:2:4 should be used when concrete is deposited under water.—*Acco Pipe Notes.*

Reinforcing Steel Institute to Meet in South

Biloxi, Mississippi, was selected as the place of convention for the fourth annual meeting of the Concrete Reinforcing Steel Institute, on March 19th to 21st, at the Edgewater Gulf Hotel. This location is two hours from New Orleans, on the Mississippi Gulf Coast.

No program announcement has yet been made.

Economy in the Use of Local Materials for Concrete

A Discussion of the Possible Use of More Easily Obtained Local Materials in Some Localities—Their Effect on the Cost of Concrete—Their Probable Influence on the Quality of Concrete—Local Aggregates Tested in Miami Paving Project

By G. W. HUTCHINSON
Chief, Concrete Engineering and Inspection Bureau, Lake Worth, Fla.

THE various theories regarding the design of concrete mixtures have led us to believe that we have controlled all factors necessary to make economic concrete from given materials. This may or may not be true, and in all probability various points will be disputed for some time to come, in that all researchers have their own opinions and, frequently, these are hard to change. On the other hand, we must admit that within the past ten years the industry has improved both theory and practice in concrete construction and rapid strides have been made in the improvement of rational concrete design.

Can Cheaper Materials Be Used?

Regardless of the various opinions as to the right or wrong of the water-cement ratio, curing, mixing time, or other factors which affect the strength of concrete, we must still bear in mind that there is another field to be considered seriously. This is with respect to the utilization of cheaper materials in making concrete. It is a well established fact that, in general, freight rates on concrete materials approximate the cost of the materials themselves. We have researched with orthodox materials, but many localities have not as yet attempted to eliminate the problem which does not directly affect the quality of the concrete, but does affect the cost—namely, transportation of materials. To a certain extent we have been held by tradition and gone into distant fields for materials rather than looked in our immediate vicinity and acted more consistently in the matter of economics.

We have, in a measure, discarded the compressive test as a measure of concrete quality. Various types of coarse aggregate when tested in concrete in compression have practically the same strength. We can take a relatively soft stone which would not stand certain other tests, and yet when made into concrete, will show favorable results. This is an argument either for or against the elimination of the compressive test of concrete as a measure of the quality of coarse aggregate for the purpose mentioned. While satisfactory compressive tests have led to the adoption of mixtures of certain materials to make successful concrete structures, we cannot accept this test as the criterion for concrete value. We then go to the transverse test and if the results of this test are satisfactory, it develops into a matter of weathering and climate as to the suitability of the material. This might appear to be a condemnation of other than so-called high grade material, but the quality of concrete in its various uses and localities is but a relative proposition.

Regardless of the methods of test, we still have the material problem confronting the industry. By spending a few thousand dollars on research work we save many times that amount in the application of the results secured. With this in mind, it would be consistent to apply this thought in connection with local against imported materials.

Local vs. Imported Aggregates

One of the outstanding problems in the development of concrete in Florida today is the utilization of local materials. An example of the use of local aggregate in concrete for economic reasons can be found in the paving program being carried on by the city of Miami. Slightly over a year ago the Concrete Engineering & Inspection Bureau was retained by B. M. Duncan, City Engineer, to go into the problem of utilizing their local coral rock as an aggregate for concrete. A survey of the situation was made and it was found that certain properties of this rock made it normally questionable for concrete aggregate when compared with the material transported from long distances to meet rigid arbitrary specifications. In the larger sizes there was a certain amount of soft material present. It was found, however, that by decreasing the maximum size of the aggregate, the soft material was eliminated, and that by limiting the maximum size to approximately one inch, the resultant product appeared satisfactory in every respect. In regard to strength and resistance to impact this change was consistent with the results of former research in regard to aggregate sizes.*

For field observation, about 3000 linear feet of pavement, thirty feet wide, was constructed on North Miami Avenue. This is one of the heaviest traveled streets in the city, both with respect to volume and weight of traffic. The pavement has been down over a year and shows no appreciable signs of wear or deterioration in any way that would allow it to be compared unfavorably with the highest type of concrete paving. The results of this experiment led the city of Miami to construct 250,000 square yards of concrete pavement this year in which the aggregate in question was specified. In this work a uniform eight-inch thickness, 1:2:3 mix, was secured for as low as $1.54 per square yard.

The nature and size of this stone does not permit it to be compared with other aggregates by the standard Deval test. The results secured, however, support the contention that the value of this test for coarse aggregate is questionable. The rock being of a so-called coral formation, is high in lime and approaches slag in its appearance. It is as hard as the matrix which surrounds it in concrete

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(*Proportioning Concrete Materials with Especial Reference to Highway Construction: G. W. Hutchinson, Proceedings Am. Conc. Inst., 1925.)

so that uniform wear may be obtained.

Considerable highway work is contemplated in the vicinity of Miami. The roads constructed of other types have developed weaknesses and in general become "wavy" under traffic within a few years after they were built. Various localities find that they have put an expensive bituminous surfacing on a base which is not consistent with the quality of the surface, and now realize that their local materials can be utilized with greatest economy by combining them in a rigid pavement of either concrete wearing surface or concrete foundation.

Economies of Local Materials

To standardize on orthodox methods and materials in concrete construction is to obstruct economic progress. The engineer can take what has gone before and accept it feeling he is safe. The progressive element must look to the more important, or economic, side. If he is to secure economy, he must produce a structure to give relatively better service than the one he has constructed before and for the same or lower cost.

According to the results so far secured, the utilization of local aggregates in south Florida will result in a saving of thousands of dollars and secure pavements suitable for the demands of traffic. The local material, in all probability, would bear further investigation for paving in the north, where frost action is one of the causes of deterioration and where so-called highest grade materials are found locally at low cost. Weathering is one of the most important properties that concrete should possess. With this in mind, it is logical that in a tropical climate, such as Florida where no frost action occurs, we should not be bound by the specifications which would be necesssary in the north.

One of the hardest tasks of the engineer or the concrete technician is to present a problem in a way that it will receive sympathy from those in charge of the specifications. Many states today are using aggregates for concrete that several years ago were discarded without question. It has been realized that it is not a matter of pounds per square inch as a measure of the quality of concrete, but that it resolves itself into one of cost against quality. The minimum suitable quality can only be determined by test and experience in each individual locality.

On account of the possibilities of paving in south Florida being greater in the future than in the past, the Florida State Road Department under Mr. J. L. Cresap, Highway Engineer, has directed a series of tests and investigations to be made in order that at such time as new construction is carried on in this vicinity the department will be able to follow its plan of economical road construction by having the necessary data on local materials to allow them to prepare the specifications in a manner consistent with their policy.

Middle West States Join Wisconsin in Annual Products Meeting

The annual meeting of the Wisconsin Concrete Products Association in session at the Hotel Schroeder, Milwaukee, on February 2nd and 3rd, is to be more than a gathering of the Wisconsin clan; it will be an interstate, middle-west affair, with products makers from Iowa, Illinois, Minnesota, North and South Dakota as well as Montana attending.

This will be the annual meeting also for the guest associations.

Products Makers To Be Heard at A. C. I. Gathering

At least one session of the coming American Concrete Institute convention to be held February 28th to March 1st at the Benjamin Franklin Hotel, Philadelphia, will be devoted to problems of the concrete products and specialty manufacturer. One of the steps to be taken will be the agreement upon standard specifications for concrete cast stone that are not too restrictive upon manufacturers in their choice of the processes used. Standardization, to some degree, is sought of the resulting quality of the material and its placing on a better footing in the eyes of architects and engineers. A number of manufacturers are on the program to discuss specifications. At their own meeting of the Concrete Products Association, to be held at the Benjamin Franklin Hotel on February 27th and 28th, the products makers will discuss this and other subjects.

Among the products makers who will be heard at the Institute meeting is D. R. Collins. He will present a paper telling what the Wisconsin building code has done for concrete units in that state.

The other side of the architect-and-engineer question will be discussed by George J. Eyrick, Jr., of Smith, Hinchman & Grylls, Detroit architects and engineers. Mr. Eyrick will outline the view of architects and engineers in reference to concrete masonry units of many types. Why concrete building units are sometimes descriminated against and the basis upon which they are in competition with older materials will be frankly discussed.

Mr. Eyrick will give suggestions to be considered in the making of standard specifications, as well as his ideas on costs.

Light-weight aggregate for masonry units will also come up for discussion. A Milwaukee products manufacturer who is a user of burned clay aggregate will be heard.

The Institute's products session will deal also with its specifications for concrete brick, both from the viewpoint of Committee P-1 and the proponents of the movement to change the specifications for concrete brick and brick of other materials in the American Society for Testing Materials. At this session also will be given the report of Committee P-1, Standard Concrete Building Units, including a statement of results in its preliminary investigation of methods of tamping and feeding employed in the manufacture of dry tamped concrete masonry units, followed by a short paper by L. E. Grube, president of the Wisconsin products group, telling of the experience of the Sheyboygan Brick Company in drying concrete brick to take out shrinkage after initial curing.

Adopt Manufacture of Porous Drain Pipe

A concrete drain pipe that absorbs water throughout the entire surface of the pipe is being successfully sold to railroads by the Walker Cement Products, New York City. The pipe is porous and known as Rapid drainage pipe.

It has only recently been initiated into the United States, but has for twelve years been used by European railroads for track and station work, where it is said to have reduced track and earthwork maintenance as much as 30 per cent. The principle of Rapid drainage tile is reported to be efficient in the removal of ground water in structural work, streets, reservoirs, bridges, highways, sea walls, and other similar and diversified work.

The connecting ends, being convex and concave, fit tightly together, guaranteeing alignment with no chance of displacement.

From 146 to 192 Brick Per Sack of Cement

Series of Experiments in Proportioning Show Way to Worth While Savings in Concrete Brick Plant—Methods and Results Obtained Will Apply to Block Plants Also—Tables Show Detailed Tests Using Twelve Different Mixes

By VERNER L. PAGE
H. P. B. Sand and Gravel Company, Rockford, Ill.

DURING the past year considerable experimenting has been done at our products plant at Rockford, Ill., in an effort to improve our methods of manufacturing concrete brick. The success of these efforts is shown in detail in the tables presented on the following pages, in which the results of a series of tests using twelve different proportions of materials are tabulated.

Here are the facts abstracted from the tables:

Formerly we obtained 146 brick with each sack of cement by combining 1 sack of cement with 7 cubic feet of sand. (See Series C.) As a result of these tests we are now able to get 192 brick per sack of cement by using 1 sack of cement, 7 cubic feet of sand and 3 cubic feet of gravel. (See Series N.) With this proportion we obtained a strength of 3015 pounds per square inch in 28 days, as against the usual building code requirements of 1500 pounds per square inch.

How the Tests Were Made

For each of the 16 series, 10 brick were made. Five brick were tested when 7 days old and 5 at 28 days. As the table shows, 2 of the brick for the 28-day tests were placed on edge, while for all other tests brick were placed flatwise as they are laid in the wall. Complete details as to the proportions used are given in the table, which also shows the amount of water added for mixing, and the length of time the concrete was mixed.

The brick were made on a Besser machine, 8 brick per pallet. One tamper was used on each brick. The tampers fell together—not alternately—and struck the brick 3 times, the third tamp being on the finish plate.

The brick were cured for 24 hours in a steam curing room at an average temperature of 95 degrees F. They were then removed to an unsheltered stockpile out of doors. The weather, prior to making the 7-day tests, was cool and rainy. Warmer and drier weather was the rule during the week preceding the 28-day tests.

For making the tests, the brick were capped on both sides with a mixture of plaster of paris and cement. The specimens were tested in an Olsen 200,000 pound capacity machine, motor driven. The load was applied hydraulically through oil.

After capping, the brick tested in Series A, B, C, J. K, L, M, N, O, and P were dried over a boiler. Specimens in Series D, E, F, and G were not dried after capping.

The table, together with these remarks and the tables on this page, tells the story so completely as to need no further comments.

The writer wishes to acknowledge the assistance rendered him in making these tests by the Service Bureau of the Universal Portland Cement Company, which co-operated with us by outlining the series of tests, making sieve analyses, designing the various mixes and tabulating the final results.

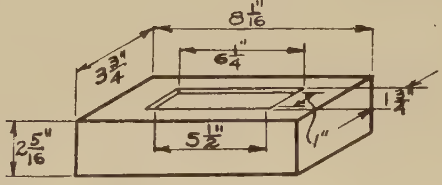
GENERAL DATA ON AGGREGATES.	Aggregate: Fine Torpedo Sand.	Aggregate: Coarse Roofing Gravel.
Fineness Modulus.	2.63	5.91
Size.	0-No.8	0-3/8
Weight-damp, loose (lbs. per cu. ft.)	92	98
Weight of 1 cu. ft. damp, & loose, after drying-lbs.	88½	96
Moisture-lbs. per cu. ft. of damp loose material.	3½	2
Weight-dry and rodded-lbs per cu. ft.	108.6	105.3
Approximate shrinkage in volume of one cu. ft. of damp, loose material when dried out and rodded-Per Cent.	20.8	4.2

Weight of combined aggregate (120# and 117.2#) Taken from curve plotted from actual volumes and weights using various proportions of the sand and gravel. Fineness Modulus of combined aggregates calculated.

ABSORPTION TEST.

Series	Weight. Dry Lb. – oz.	Weight. *Wet Lb. – oz.	Absorption Per Cent.
C	4 - 15	5 - 2½	4.43
C	4 - 15½	5 - 2	3.14
C	5 - 0	5 - 2	2.50
Av.	4 - 15½	5 - 2-1/6	3.35
P	5 - 1	5 - 5	4.94
P	5 - 1½	5 - 5	4.29
P	5 - 0	5 - 4	5.00
Av.	5 - 5/6	5 - 4-2/3	4.74

*Immersed in water 24 hours.



Depression on one face only as shown ¼" deep.

Area - Flat 8-1/16"x3-3/4" = 30.234 sq. ins.

Area - Edge 8-1/16"x2-5/16"= 18.645 sq. ins.

Vol. (8-1/16"x3-3/4"x2-5/16")-(5½"x1"x¼")-

$\left[2\left(\frac{6\frac{1}{4}+5\frac{1}{2}}{2}+\frac{1\frac{3}{4}+1}{2}\right)\times 3/8\times 1/4\right]1/2=$

69.917 - 1.375 - 0.6797 = 67.862 cu. ins =
0.03928 cu. ft.

TESTS ON CONCRETE BRICK-H.P.B. SAND & GRAVEL CO., ROCKFORD, ILL.

	Mix.			Combined Aggregate.		Water Gals. per sack of Cement.				Mixing Time in Minutes.			Yield Per sack of cement.			Compression Tests. (7 or 8 Day)					Compression Tests (28 or 29 Day)					
Series.	Field Mix. (Moist Aggregate)	Nominal Mix. (Dry and rodded separated Aggregates)	Real Mix. (Dry and rodded combined Aggregates)	Weight (Dry and rodded) lbs. per cu. ft.	Fineness Modulus.	(a) Added to Batch.	(b) Held in suspension by Aggregate.	(a) Absorbed by Aggregates.	Total +b-a.)	(a) Dry	(b) Wet	Total (a+b)	Loose concrete cu. ft.	Tamped Concrete. cu. ft. (Brick)	Number of Brick each.	Age when Tested-Days.	Position of Brick as Tested	Initial Break (Corners) Pounds.	Total Load at Failure Pounds.	Ultimate Strength lbs. per sq. in.	Age when Tested-Days.	Position of Brick as Tested	Initial Break (Corners) Pounds.	Total Load at Failure (Pounds)	Ultimate Strength lbs. per sq. in.	-REMARKS-
A	1:5.6		1:4.56	108.6	2.63	3.20	2.35	0.59	4.96			7	6.61	*4.75	121 2	7	Flat	55000	°68800	2275	28	Flat	91460	144980	4795	Brick made May 4, 1927. In P.M. (Wed.)
A																7	"	55000	80260	2655	28	"	97280	134820	4460	
																Average		55000	74530	2465						
A																8	Flat	62000	78910	2610	28	"	112740	135900	4495	*Reduction in vol. of conc. due to tamping = 28.1% °Bearing not even.
																					Average		100500	138570	4585	
A																8	"	55000	82800	2740	28	Edge	27560	32640	1750	
A																8	"	65000	73900	2445	28	"	38660	39900	2140	
																Average		60670	78540	2590	Average		33110	36270	1945	
B	1:5.6		1:4.56	108.6	2.63	3.20	2.35	0.59	4.96	5	3	8	6.08	*4.79	122.0	7	Flat	76360	85700	2835	28	Flat	123560	133280	4410	Brick made May 4, 1927. In P.M. (Wed.)
B																7	"	65000	90260	2985	28	"	110080	144180	4770	
																Average		70680	87980	2910						
B																8	Flat	87200	92000	3045	28	"	119040	134020	4435	*Reduction in vol. of conc due to tamping = 21.2%
																					Average		117560	137160	4540	
B																8	"	55000	83850	2775	28	Edge	40780	41140	2205	
B																8	"	62000	89460	2960	28	"	39200	42400	2275	
																Average		68070	88440	2930	Average		39990	41770	2240	
C	1:7.0		1:5.70	108.6	2.63	3.75	2.94	0.74	5.95			9	7.29	*5.75	146.5	7	Flat	62000	70900	2345	28	Flat	103500	121460	4015	Brick made May 4, 1927. In P.M. (Wed.)
C																7	"	60000	65320	2160	28	"	74200	113560	3755	
																Average		61000	68110	2250						
C																8	Flat	55000	81900	2710	28	Flat	90700	122000	4035	*Reduction in vol. of conc. due to tamping = 21.1%
																					Average		89470	119010	3985	
C																8	"	42300	68100	2150	28	Edge	29300	33050	1770	
C																8	"	52400	70490	2330	28	"	29400	30200	1620	
																Average		49900	72500	2395	Average		29350	31625	1695	
D	1:3:2.75	1:2.44:2.51	1:4.41	120.0	4.29	3.00	1.92	0.64	4.28	3	8	11	5.63	*4.60	117.0	7	Flat	76000	168710	5250	28	Flat	155500	161890	5355	Brick made May 5, 1927. In P.M. (Thurs.) *Reduction in vol. of conc. due to tamping = 18.3%
D																7	"	112000	165200	5465	28	"	138300	165000	5455	
D																7	"	85700	161560	5345	28	"	128000	144100	4765	
																					Average		140600	156995	5190	
D																7	"	99300	168260	5570	28	Edge		81620	4380	°Bearing not full on end.
D																7	"	89000	180040	5985	28	"		°65200	3490	
																Average		92000	166760	5515	Average			73410	3935	
D																					29	Flat	137700	149700	4950	
D																					29	"	140540	144400	4775	
D																					29	"	124500	154640	5115	
																					Average		134250	149580	4945	
D																					29	Edge		61100	3275	
D																					29	"		65140	3490	
																					Average			63120	3385	
E	1:4.67:3.17	1:3.79:2.89	1:5.98	120.0	4.05	*3.13	2.78	0.86	5.00	2	13	15	7.58	°6.09	155.0	7	Flat	99500	127240	4210	28	Flat	110240	122480	4050	Brick made May 6, 1927. In A.M. (Friday) *Includes about a pint of water in skip. Sand and gravel dripping. °19.7% reduction in vol.
E																7	"	102600	114140	3775	28	"	98720	117380	3880	
E																7	"	108000	121140	4010	28	"	88600	100580	3325	
																					Average		99190	113480	3750	
E																7	"	95440	124800	4130	28	Edge		48920	2625	
E																7	"	101300	115920	3835	28	"		42040	2255	
																Average		100770	120650	3990	Average			45480	2440	
F	1:5:3	1:4.07:2.74	1:6.09	120.0	3.95	4.00	2.83	0.88	5.95	3	6	9	8.38	*6.01	153.0	7	Flat	88500	124320	4110	28	Flat	88800	114960	3800	Brick made May 6, 1927. In A.M. (Friday)
F																7	"	108600	134200	4440	28	"	104360	117640	3890	
F																7	"	85000	110600	3660	28	"	97520	120380	3980	
																					Average		96895	117660	3890	
F																7	"	91200	119860	3965	28	Flat		49500	2655	*Reduction in vol. of conc. due to tamping = 27.9% (?) °High corner.
F																7	"	°60000	119760	3960	28	"		51130	2740	
																Average		86660	121750	4025	Average			50315	2700	

G	1:4.5:3.5	1:3.67:3.19	1:6.12	120.0	4.16	3.50	2.73	0.88	3.35	3	5	8		6.25	139.0	7	Flat	65000	90900	3010	28	Flat	84800	95940	3105	Brick made May 6, 1927.
G																7	"	76500	105200	3480	28	"	76420	85700	2835	In A.M. (Friday)
G																7	"	78000	96460	3195	28	"	80480	93500	3095	
																					Average		80670	91050	3010	
G																7	Flat	86200	96620	3195	28	Edge	*	37120	1990	*Bearing not full on corner.
G																7	"	66400	*88200	2915	28	"		27140	1455	
																Average		74420	95480	3160	Average			32180	1725	
H	1:3:1½	1:2.45:1.37	1:3.41	120.0	3.81	*2.00	1.62	0.49	3.18			12	4.5	*3.57	91.0	8	Flat	38940	68160	2255	28 Day test not made account of not having been piled separately. This series questionable thruout.					Brick made May 13, 1927.
H																8	"	51800	73740	2440						In P.M. (Friday) Rain
H																8	"	47580	78400	2430						*Aggregate wet and water dripping into skip.
H																8	"	56260	81640	2700						Slump Test — 0
H																8	"	51460	67200	2225						*20.7% reduction in volume.
																Average		49110	72880	2410						
J	1:6:3½	1:4.89:3.19	1:7.23	120.0	3.93	3.00	3.36	1.04	5.82	3	6	9		6.64	169.0	7	Flat	*42480	67120	2220	28	Flat	83780	110700	3660	Brick made May 13, 1927.
J																7	"	58360	77740	2370	28	"	98480	127800	4225	In P.M. (Friday)
J																7	"	41620	69500	2300	28	"	67760	110140	3645	* 1 corner not bearing.
																					Average		83340	116215	3845	
J																7	Flat	*33500	64860	2145	28	Edge		43450	2330	
J																7	"	48540	64540	2135	28	"		32820	1760	
																Average		48900	68750	2275	Average			38135	2045	
K	1:6:3	1:4.89:2.74	1:6.83	120.0	3.81	3.00	3.24	0.98	5.26			6		6.72	171.0	7	Flat	47840	73940	2445	28	Flat	88700	111180	3675	Brick made May 13, 1927.
K																7	"	50000	70860	2345	28	"	54960	78260	2590	In P.M. (Friday)
K																7	"	49820	62600	2075	28	"	74870	107660	3560	
																					Average		72845	99035	3275	
K																7	Flat	46800	55900	1850	28	Edge		24900	1335	
K																7	"	56200	70510	2330	28	"		23020	1235	
																Average		50070	66760	2210	Average			23960	1285	
L	1:6½:3	1:5.30:2.74	1:7.19	120.0	3.75	2.50	3.48	1.03	4.91	4	7	11		7.23	184.0	7	Flat	64520	72240	2390	28	Flat		108700	3595	Brick made May 13, 1927.
L																7	"	48540	58020	1920	28	"	99430	148020	4895	In P.M.
L																7	"	43000	56510	1870	28	"	64120	101100	3345	
																					Average		81775	119275	3945	
L																7	Flat	47840	63040	2080	28	Edge		25400	1360	*Poor sample. Corner chipped off.
L																7	"	35260	*50640	1675	28	"		26360	1415	
																Average		47830	60090	1990	Average			25880	1390	
M	1:6½:3	1:5.30:2.74	1:7.19	120.0	3.75	4.00	3.48	1.03	6.42	3	5	8		7.23	184.0	7	Flat	60710	78640	2600	28	Flat	69480	116200	3845	Brick made May 14, 1927.
M																7	"	47900	71520	2365	28	"	85740	127420	4215	In A.M. (Sat.)
M																7	"	67540	84180	2785	28	"	96560	124280	4110	
																					Average		83930	122635	4055	
M																7	Flat	70060	87400	2890	28	Edge		28260	1515	*Bearing not even.
M																7	"	*58740	72560	2400	28	"		31080	1665	
																Average		60990	78860	2610	Average			29670	1590	
N	1:7:3	1:5.70:2.74	1:7.74	117.2	3.70	4.00	3.67	1.09	6.58	2	6	8		7.54	192.0	7	Flat	60600	70000	2315	28	Flat	68940	*85280	2820	Brick made May 21, 1927.
N																7	"	62160	71040	2350	28	"	82700	97500	3225	In A.M. (Sat.)
N																7	"	48400	62310	2060	28	"	67270	90900	3005	*Cap on 1 corner chipped.
																					Average		72970	91225	3015	
N																7	Flat	54500	61090	2020	28	Edge		31310	1680	Not well centered in testing machine.
N																7	"	55440	58920	1950	28	"		*24680	1325	
																Average		56220	64670	2140	Average			27995	1505	
O	1:7:3	1:5.70:2.74	1:7.74	117.2	3.70	4.50	3.67	1.09	7.03	3	3	6		7.54	192.0	7	Flat	55270	65240	2160	28	Flat	68420	90540	2995	Brick made May 21, 1927.
O																7	"	48380	55860	1845	28	"	75880	92460	3060	In A.M. (Sat.)
O																7	"	49100	53660	1775	28	"	68620	82350	2725	
																					Average		70975	88450	2925	
O																7	Flat	47460	59660	1975	28	Edge		25120	1345	
O																7	"	56400	66800	2210	28	"		24680	1325	
																Average		51320	60245	1995	Average			24900	1335	
P	1:7:3	1:5.70:2.74	1:7.74	117.2	3.70	5.00	3.67	1.09	7.58	2	3	5		7.54	192.0	7	Flat	55400	64240	2125	28	Flat	62600	84550	2795	Brick made May 21, 1927.
P																7	"	47120	62080	2055	28	"	58900	83210	2750	In A.M. (Sat.)
P																7	"	48440	55540	1835	28	"	72640	90180	2985	
																					Average		64715	85980	2845	
P																7	Flat	50620	61160	2025	28	Edge		27220	1460	
P																7	"	43340	53330	1765	28	"		23920	1285	
																Average		48985	59270	1960	Average			25570	1375	
X	1:5½:1½	1:4.48:1.37	1:5.26	120.0	3.33		2.67	0.76								7	Flat	118800	132760	4390						Brick made May 6, 1927
X																7	"	103800	129920	4295						In P.M. (Fri.)
X																7	"	109200	128500	4250						
X																7	"	106200	137460	4545						
X																7	"	104000	134150	4435						
																Average		108400	132560	4385						

Shall Cement Be Sold Direct to Products Manufacturers?

An Open Letter by Austin Crabbs

The National Builders Supply Association, meeting in annual convention at Cleveland, Dec. 5th and 6th, 1927, resolved that their association "Go on record, as being unalterably opposed to the proposed change of selling policy on the part of the (cement) manufacturers." This policy contemplated the sale of cement direct to railroads, hydro-electric plants, concrete block manufacturers, and contractors doing state, county, or municipal work.

This question "tended to whet an already keen membership interest and to increase the attendance" at the dealers' meeting and the "unanimous opinion of all its members" with the resultant resolution, puts squarely before the concrete products manufacturers this proposition which till now they, in most cases, have seen fit to ignore in full confidence that the problem eventually would work itself out along the line of the greatest good to the greatest number —not overlooking the ultimate consumer.

As manufacturers, we feel that our problems are not those of railroads, or public work contractors, and we cannot help but resent the attitude of the dealers, who decide, without hearing our side of the story, any issue that may be contrary to our best interests. To our mind, the whole discussion at the Cleveland dealers' convention indicates but one thing, and that is, that the co-operation which should be found between the building material dealer and the concrete products manufacturer does not exist.

Our problems should be more or less mutual, at least insofar as the sale of more concrete products is concerned, and any differences should be worked out on these fundamental grounds. Perhaps, as concrete products manufacturers, the question is, shall we buy our cement from, or sell our product to the dealer and in the co-operation that the dealer will offer us lies the answer to these questions.

The question of cement purchases gives every indication of materially increasing the interest in and attendance at the annual convention of the Concrete Products Association in Philadelphia, Febuary 27th and 28th, 1928.

Construction Volume for Year Reaches Highest Mark

The greatest volume of construction work ever recorded for a single year was carried on during 1927, according to statistics just compiled by the Associated General Contractors of America. These figures, representing all types of construction activity, show 1927 to have outstripped 1926, its nearest rival among the years, by a comfortable margin, an increase of more than four per cent being noted.

The new record, involving expenditure of approximately eight billion dollars, was set despite a perceptible lag in activities during the first two or three months of the year.

The year just ended showed a marked decline in the operations carried on by speculative builders, which had so strongly characterized 1925 and 1926. This decline naturally resulted in a corresponding decrease in home building activities in many sections of the country.

Increases in the construction of industrial plants, hotels, office buildings, apartment houses, public works projects and railroads, had the effect, however, of more than offsetting this decline and making a new construction record possible.

Concrete Tile Given Greater Leeway by Los Angeles Building Code

The Los Angeles building ordinance was revised in December on recommendation of the Building and Safety Commission to the extent of permitting greater leeway in the use of hollow concrete tile. Under the new ordinance signed by the mayor these concrete units may be used in the downtown fire district without restriction other than that imposed on all masonry units.

The recommendation of the Building and Safety Commission was based largely on the excellent showing made by 8-inch and 12-inch walls of concrete tile during the standard fire and water tests conducted by the Underwriters' Laboratories and reported in that organization's Retardant Report No. 1881, dated November 10, 1926.

This is the second time within the last twelve months that amendments to the Los Angeles building ordinance granted more favorable treatment to hollow concrete masonry units. An earlier amendment, passed in April, 1927, resulted in a substantial increase in the demand for these products. The change adopted more recently is expected to serve as a further stimulant to the industry.

Super Cement Distinguished from High Early Strength Portlands

To clear up any confusion existing regarding its trademarked name, the Super Cement Company, Detroit, Michigan, calls the attention of cement users to the fact that Super Cement is the registered trade marked name of those cements manufactured under the patents of the Super Cement Company and under its direction.

This Super Cement is not to be confused with the special portland cements having high early strength qualities and which are on the market in some localities.

Pipe Men at Crescent City

The usual select group of men interested in concrete pipe attended the annual convention of the American Concrete Pipe Association, January 24, 25 and 26 at the Roosevelt Hotel in New Orleans.

The annual dinner Wednesday night was attended by city officials and engineers from surrounding states who also participated in the discussion of mutual problems in the general session.

The program, as usual, was strictly devoted to problems of the industry including standardization, executive matters, etc.

Coming Conventions

February 27th, 28th—Concrete Products Association, at the Benjamin Franklin Hotel, Philadelphia, Pa. Annual convention.

February 28th, 29th, March 1st—American Concrete Institute, at Benjamin Franklin Hotel, Philadelphia, Pa. Twenty-fourth annual convention.

March 1st, 2nd, 3rd—National Cinder Concrete Products Association, at the Benjamin Franklin Hotel, Philadelphia, Pa. Fifth annual convention.

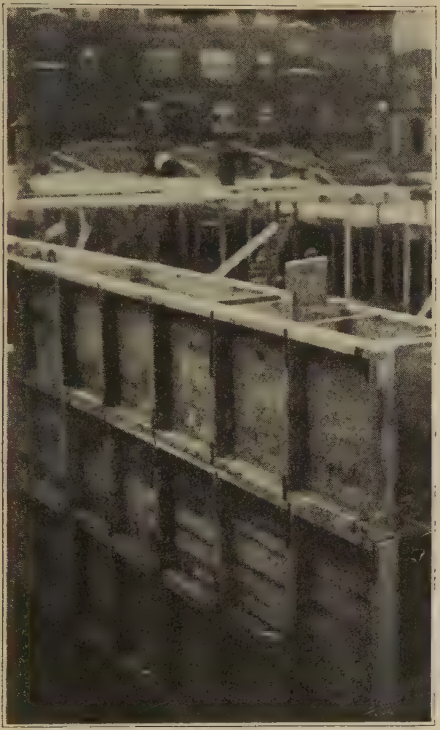
March 19th to 21st—Concrete Reinforcing Steel Institute, at Edgewater Gulf Hotel, Biloxi, Mississippi. Fourth annual meeting.

Standardized Wall Forms Save Time and Money

A CHICAGO contractor has worked out a form system for walls, particularly basement walls, which he has tested thoroughly on the job and found unusually efficient. It is a great time saver both on the erection of the forms and on the stripping of the forms. It is further recommended by its extreme simplicity.

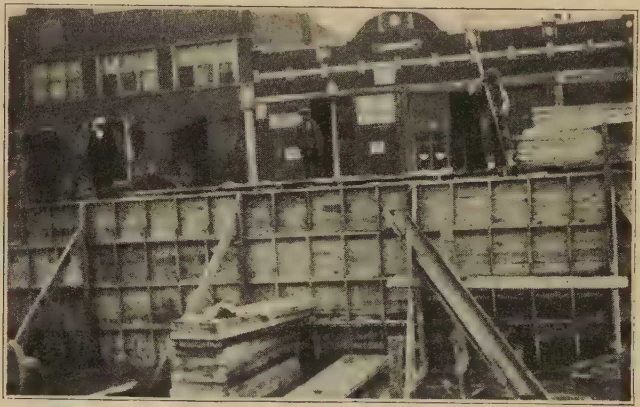
The basic unit of the system is a conventional form panel of convenient size which is constructed in the shop. There is no particular rule governing the size of these panels, but a size about 3x10 feet seems to be very satisfactory.

Panels are bound together in pairs as shown in Figure 1. They are held the proper distance apart by spreaders and tied together with strips of light galvanized strap iron which is nailed to the cross members of the panel with Neider's double-headed nails. The strap iron is bound tightly enough to make each pair of panels into a substantial box-like affair which has neither top, bottom, nor ends, and which is stiff enough to be handled freely on the job.



Section of form ready for pouring

These sets of panels are piled up on each other just like a set of blocks in order to erect a complete wall form. Very little bracing is needed to hold them in place. A plank running up where the ends of the panels join and braced with a timber of suitable size is about all that is necessary on the ordinary job. The strap irons which hold the panels together serve very well as form ties when the complete form for a wall is erected.



Section of form, showing the small amount of bracing necessary

The stripping of the form is exceedingly simple. The use of the double-headed nail makes it possible for a man with a claw-hammer to loosen the ends of the strap iron very rapidly, and one or two men following him can lift down the panels with very little effort. The protruding ends of the strap iron can then be clipped off as with any other type of form tie, and the job is finished.

Although there are no complexities to this system, its extreme simplicity of erection, and the great rapidity with which it can be stripped from the concrete recommends it very highly. There is also little danger of any damage being done to the form panels, and they can be used over and over again almost indefinitely.

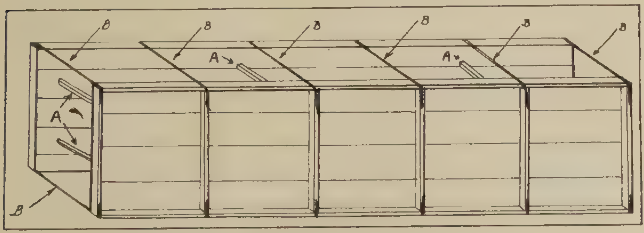


Figure 1

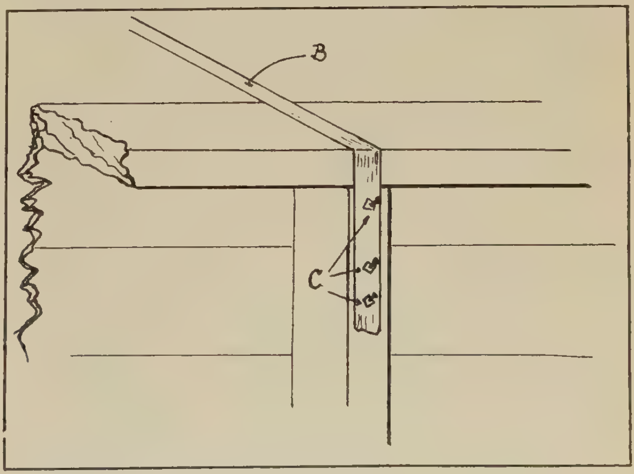


Figure 2

Drawings showing construction of the forms. A denotes spreaders, B strap iron, and C double-headed nails

Mixer Musings

Reported by "Joe"—The Mixer Boss.

Joe The Mixer Boss
"Concrete"
Chicago,
Dear Joe:

Do you believe in "autoscribblity," for the enclosed is a sample? Having eaten more than my fill of Thanksgiving turkey and pumpkin pie I drowsed off to sleep, and had a queer dream, (I had just previously read a book on "Sherlock Holmes" by Arthur Conan Doyle), and when I awoke the enclosed manuscript was in my hands.

Yours very sincerely,
(Signed) J. Sayres Lain, M. G. C. S. T.

CONCRETE presents below the first gripping installment of the mysterious case confronting the great detective:

The Strange Case of the Lost Cone

By J. S. LAIN, C.S.T.

(With Apologies to Sir Arthur Conan Doyle)

"HERE," said Duff, the famous investigator, "Is a case that interests me strangely. Mr. X, a member of the Guild of Certified Slump Testers, has lost his cone. To you, my dear Watson, it might seem a trivial thing for a man to lose a tool, but let me tell you, it has never been known to happen before for a Certified Slump Tester to lose his cone. His cone is to him as a mitre is to a bishop. I reiterate, therefore, that the cone was stolen. Here are the mystifying facts as related to me by Mr. X:

"'I was looking for a Fineness Modulus in a pile of aggregate, and I put my cone (which I always carry with me) on a void in the aggregate whilst I adjusted my sieves. After a little search, having found a big one, I was about to put it back when, to my horror, I saw that my cone was missing. My first act, after I regained consciousness, was to have all the concrete dug up that had been poured that day. It was then about 5 o'clock and the men were preparing to go home, but with a promise of double time and a bonus for the one who found it, they set to work to dig up the 500 yards poured that day.

"'Imagine my feelings when the last cubic foot was dug out and my cone had not been found. I realized that a deep plot must be on foot to ruin me. Only the day before, whilst sitting at my water-cement ratio table, I heard a tap dripping, and rushed out to find a foreign laborer washing his hands in the water tank.'"

With these words Duff broke off. I could see he had an inspiration. There he sat, puffing his pipe and fondling one of his test cylinders. I knew it was more than my friendship was worth to disturb him in this mood, so, having had a heavy day with my patients, I slipped quietly to bed.

I was awakened about 12 o'clock next day by Duff, who was disguised as a concrete laborer. In his hand was a strangely shaped metal object that closely resembled a dunce's cap with the point cut off. I could see by the look on his face that he was on the scent, that is, he had found a clue. Imagine my pleasure then, when my friend put the metal object in my hand and said, "Here is the truncated cone of the Certified Slump Tester."

How did Duff find the cone?

You will know if you read the second and concluding chapter of this great serial in the next issue.

Joe, the Mixer Boss.

Organizations

American Concrete Institute; Harvey Whipple, Secretary, 2970 West Grand Blvd., Detroit, Michigan.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 W. Grand Ave., Chicago.

American Construction Council; Dwight L. Hoopingarner, Executive, 28 W. 44th St., New York City.

American Engineering Standards Committee; Dr. P. G. Agnew, Secretary, 29 W. Thirty-ninth St., New York City.

American Road Builders' Association; Chas. M. Babcock, President; Miss E. A. Birchland, Secretary, 29 W. Thirty-ninth St., New York City.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 W. Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; D. H. Sawyer, Secretary, 1150 Munsey Bldg., Washington, D. C.

Associated Metal Lath Manufacturers; 123 W. Madison St., Chicago; Wharton Clay, Commissioner.

Building Officials Conference of America; H. E. Plummer, President; Fred W. Lumis, City Hall, Springfield, Mass., Secretary.

Concrete Reinforcing Steel Institute; M. A. Beeman, Secretary, Tribune Tower, Chicago.

Concrete Products Association; S. I. Crew, President, Norwood, Ohio; Austin Crabbs, Secretary, Box 343, Davenport, Iowa.

Iowa Concrete Products Association; Floyd Goodrich, President; R. L. Gavin, Secretary-Treasurer, 405 Hubbell Bldg., Des Moines, Iowa.

National Association of Building Trades Employers; A. E. Coleman, President; A. W. Dickson, Executive Secretary, 2226 Builders Building, Chicago, Ill.

National Association of Builders' Exchanges; William F. Chew, Baltimore, President; Earl F. Stokes, Secretary, 15 E. Fayette St., Baltimore, Md.

National Crushed Stone Association; J. R. Boyd, Secretary, 751 Earle Building, Washington, D. C.

National Housing Association; Lawrence Veiller, Secretary and Director, 105 E. Twenty-second St., New York City.

The National Lime Association; G. B. Arthur, Secretary, 927 Fifteenth St., N.W., Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 933 Leader-News Building, Cleveland, Ohio.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 432 Munsey Building, Washington, D. C.

Nebraska Concrete Products Association; A. N. Anderson, President, Reimers-Kaufman Co., Lincoln, Neb.; E. L. Bateman, Secretary, Bethany, Neb.

Ohio Concrete Products Association; G. M. Friel, Secretary-Treasurer, 2284 North High St., Columbus, Ohio.

Portland Cement Association; William M. Kinney, General Manager, 33 W. Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary, Builders' Building, 228 N. La Salle St., Chicago, Ill.

Wisconsin Concrete Products Association; A. P. Kuranz, Secretary-Treasurer, 425 E. Water St., Milwaukee, Wisconsin.

New Equipment and Materials

The Blystone Automatic Block and Tile Machine

The new Blystone Automatic block and tile machine, mentioned in a recent article describing the plant of the Hammond Concrete Block Works at Hammond, Ind., has aroused a great deal of interest. On this page some additional facts regarding the machine are presented.

The machine is entirely automatic in operation. Even the pallets are fed automatically from a basket at the back of the machine. The machine, as it is now available, has been carefully tested out and improved during the past year, before being offered to products manufacturers.

The illustrations on this page give a general idea of the appearance and character of the machine.

Its operation is as follows: First, the drawer moves out from underneath the hopper, carrying with it about 20 per cent more material than is needed to make the products formed by each operation. The drawer is equipped with a movable bottom. As it is pushed forward, a pallet is also carried along underneath the drawer to a cradle ready to receive it. After the drawer is placed over the mold box, the cradle descends, taking the pallet down to the bottom of the mold box.

During the next operation, the bottom of the drawer is pulled back, thus distributing the concrete evenly from the front end to the rear of the mold box. The ram then descends exerting a pressure of 19,000 pounds. The ram remains in this position until the lower cylinder has pushed the cores up into the mass, during which process a pressure of 38,000 pounds is exerted.

The upper ram then ascends to its former position and the drawer is pulled back, taking with it the excess concrete that is not needed. The machine then pushes the block up out of the mold and forward onto a conveyor or table as the drawer comes forward with another batch of concrete.

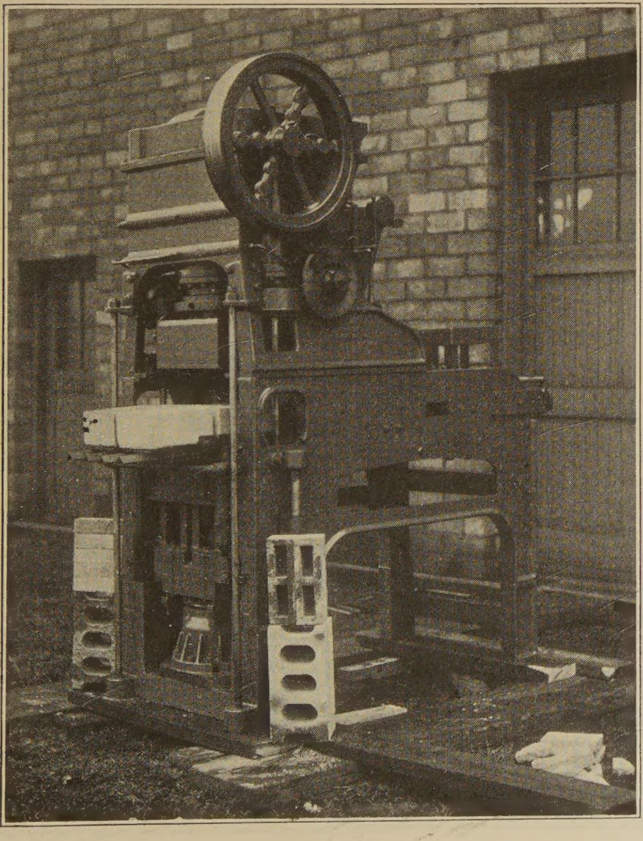
The rams are operated by oil pressure. The arrangement is as follows: Twenty gallons of oil are placed in the reservoir in the illustration at the top of the machine. A 4-cylinder pump is located in this same reservoir, the pump being used to force the oil to the distributing valve which, at the proper time, distributes the oil to the several cylinders when it is necessary for them to act.

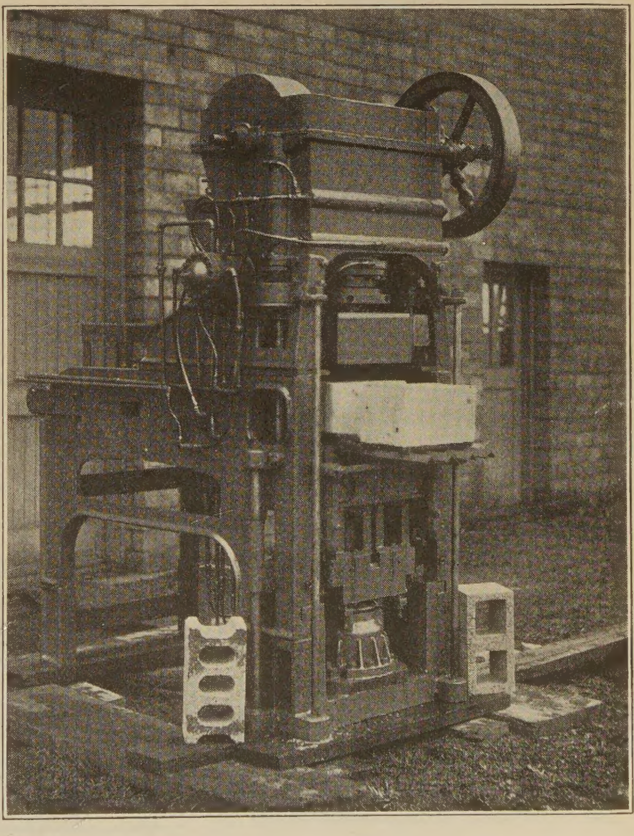
The pump cylinders are a part of the large casting on the top of the machine. They are bored so as to provide for putting in ¼-inch bushings.

The distributing valve is carefully machined and the end thrust motion is taken care of by a roller bearing. All of the working parts of the machine operate in oil which naturally makes operation very quiet.

Being almost entirely automatic, the machine eliminates the human element. A uniform pressure is always exerted, making the block of equal density from top to bottom. The method used also assures units with sharp, true corners and accurate dimensions.

The machine is manufactured by the Blystone Manufacturing Co., Cambridge Springs, Pa.



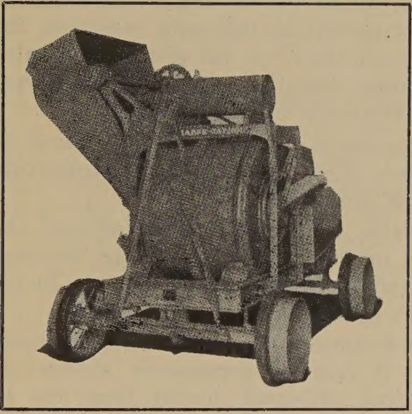


New Equipment and Materials

Use Wide Rim Wheels on Mixer for Portability

A new type of roller bearing wheel for portable concrete mixers which is designed to give a wide tread for soft footings and a rubber tire for easy towing has been announced as standard equipment on Marsh-Capron mixers.

The new wheel is equipped with a steel rim 8 inches wide and 20 inches in diameter which is the proper size to receive a standard 3½ inch solid rubber tire 24 inches in diameter which is pressed on in the usual way. The steel spokes are set to one side of this rim and the rubber tire is pressed on this side so that some 4½ inches of rim projects out beyond the tire.



This permits the mixer to run on the rubber tires for towing or when there is firm footing. When soft footing is encountered the tire sinks in until the full width bears on the ground and gives an effective wheel width of 8 inches.

The hub has also been completely redesigned in order to receive a set of Timken bearings which give added ease of rolling and assure long life and true running wheels.

The new wheel has been developed especially to meet the demands for sewer and waterwork contractors where portability is always an important factor.

New Acid-Resisting Cement on U. S. Market Soon

From England comes an announcement of the manufacture of a new acid and waterproofing cement known as Prodorite, to be employed in lining acid tanks, process tanks, vats and sumps, and similar structures. The material is claimed to be non-corrodible, non-porous, and non-conductive and its density of such character that it is unaffected by concentrated hot or cold hydrochloric acid.

Official tests using standard material are said to have given crushing strengths of over 6,000 lbs. per square inch.

Until now the material has been applied only in England, by skilled workmen. It is marketed by Prodorite Limited, Eagle Works, Leabrook, Wednesbury, Staffs, England. It is expected that within a short time manufacture of the material will begin in the United States.

New Milcor Metal Lath Clip Perfected

Finishing touches have been added to a new metal lath clip developed by the Milwaukee Corrugating Company, Milwaukee, Wisconsin. This is a clip designed to secure Milcor Stay-Rib Metal Lath to flanged structural supporting and framing members such as I-beams. A flat metal strap and a strong U-shaped tie-wire comprise the clip. The metal strap is made of No. 16 gauge, 1-inch band iron and is hook-shaped at one end, designed to slip over one flange of an I-beam or any other type of flanged supporting member. The other end of the strap is straight and remains so until the clip is placed in position; then this end is hammered or clinched around the opposite flange of the beam. This makes the strap adjustable to any size of flanged metal lumber.

The U-shaped tie-wire is made of No. 12 gauge steel wire, and when the clip is assembled, the two legs project up 2½ inches, at right angles, through holes punched in the strap for this purpose. When the lath is applied the two legs of the tie-wire extend up through the lath, straddling the rib, and are clinched or twisted tightly on the upper side; thus they hold the lath securely.

The position of the strap may be adjusted along the flange after the lath has been laid; this makes it possible to fit the wire legs so that they project through the lath without distorting the lath or the clip.

This clip provides a means of easily and conveniently anchoring metal lath securely to any type of flanged, structural supporting member. It will hold the lath at any angle, whether it be for floors, ceilings or walls. Where Milcor ¾-inch Stay-Rib No. 3 Metal Lath is used as a base for concrete floors, this clip provides a method of securing the lath to the metal lumber.

New 27-E Smith Paver Exhibited

The new T. L. Smith 27-E paver was on display for the first time at the Cleveland Road Show. Improvements and refinements are numerous and include a perfected water tank.

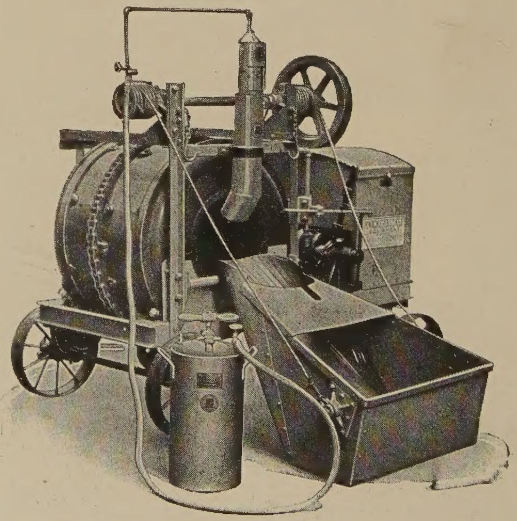
This measuring tank follows the design of devices used to measure liquids for sale, such as gasoline dispensers. It is claimed to be accurate to the ounce, simple in construction and practically trouble-proof.

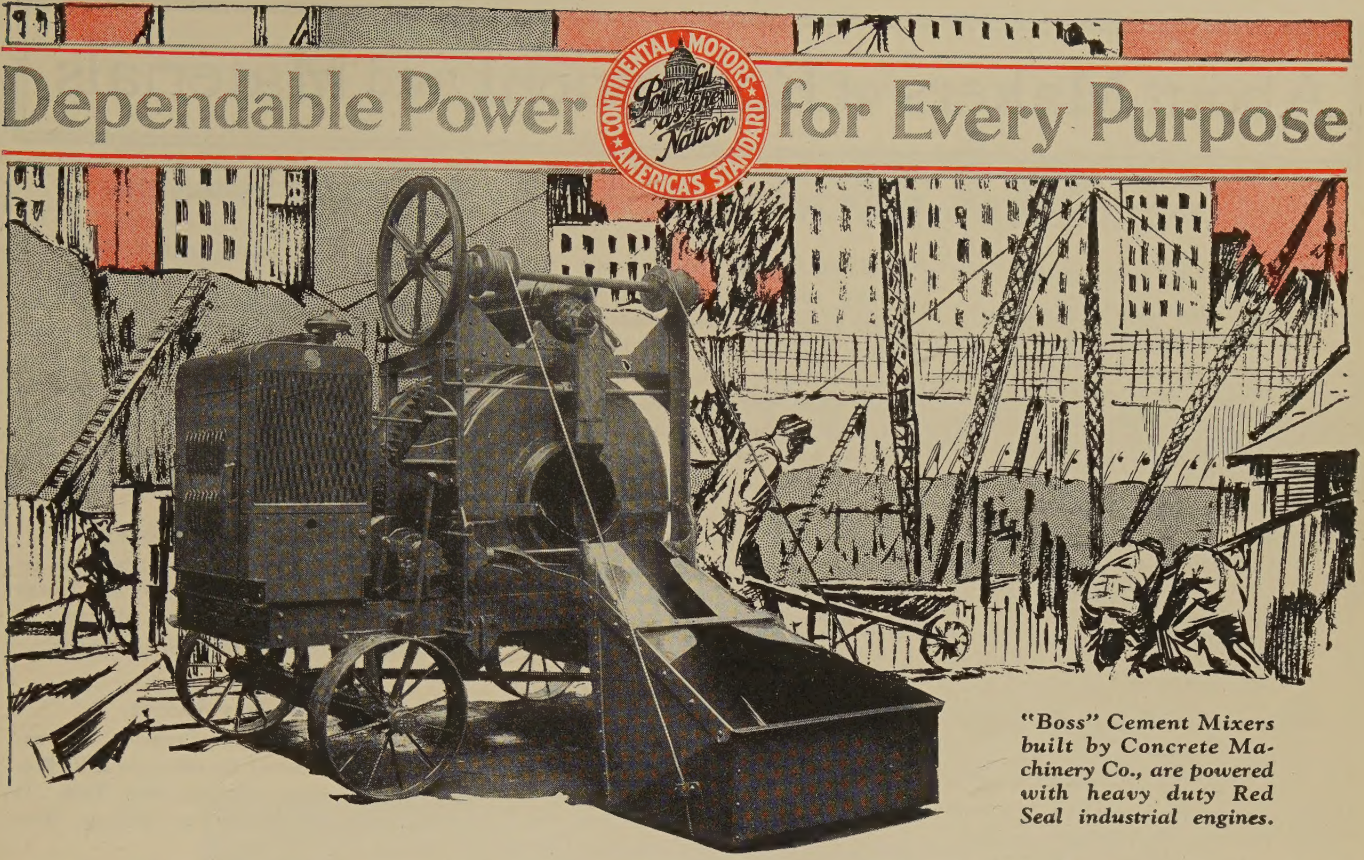
The new Smith 27-E includes a 57 h.p. 6 cylinder motor as standard equipment. Timken and Hyatt roller bearings and SKF ball bearings are used, with regard for the advantageous use of each type.

The Littleford Heater

Tilting or non-tilting mixers may be fitted with the kerosene-burning concrete heaters produced by Littleford Brothers, Cincinnati, Ohio.

The heaters are equipped with such conveniences as a windshield on the burner and a valve adjusting the flame to any size.





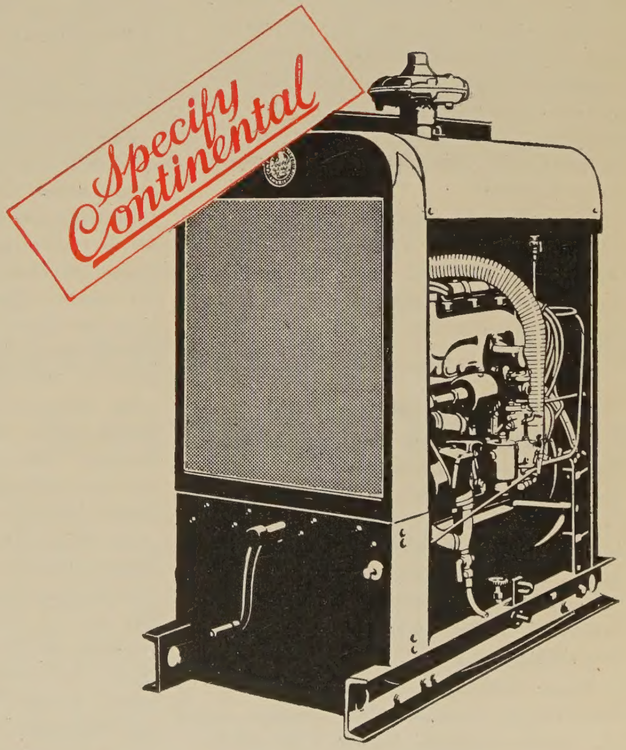
"Boss" Cement Mixers built by Concrete Machinery Co., are powered with heavy duty Red Seal industrial engines.

The Heart of Industry

Experienced over the years in interpreting the power needs of an industry, Continental is able to strike right at the heart of industrial necessity by developing special models of industrial engines capable of greater power, more flexibility, better economy and longer life.

There is a complete line of heavy duty Red Seal Continental engines for every industrial need. Specify Continental and enjoy these qualities together with the protection which has contributed to Red Seal leadership in industrial power.

CONTINENTAL MOTORS CORPORATION
INDUSTRIAL EQUIPMENT DIVISION
Office and Factory: Muskegon, Michigan
The Largest Exclusive Motor Manufacturer in the World



Continental Motors

About Makers of Equipment and Materials

INDUSTRIAL LITERATURE

Facts on Super Cement

The "How-Why-Where" of *Super Cement,* now manufactured also by the *Lawrence Cement Company,* New York, under the *"Dragon"* brand name, is told in a 20-page booklet setting forth its qualities.

The introduction tells what Super Cement is, its uses in waterproofing, acid-resisting and oilproofing, in pavement and stucco. Following these are lists of the buildings in which Super Cement has been used, where it should be used, and the opinions of users.

"Concrete of Unusual Character"

Bulletin 23 published by the *Kansas City Testing Laboratory* is entitled *"Portland Cement Concrete of Unusual Character."* This is a 24-page booklet dealing with the preparation of concrete for special purposes.

Waterproofing, prevention of freezing, quick hardening, improving workability, insulation against heat or cold, soundproofing, prevention of parasitic growths, and acidproofing are the topics covered. The methods available for best treating the concrete to obtain the result desired is told in some detail, one chapter being devoted to each subject.

One interesting chapter is devoted to "Light-Weight and Fireproof Concrete." *The Kansas City Laboratory* has made a fire test of light-weight aggregate and the result is given in this chapter.

MultiFoote Specifications

Unusually arranged and illustrated is the catalogue of specifications put out by the Foote Company, Inc., Nunda, New York. Protected by a dark, substantial cover, the new booklet describes the features of the MultiFoote paver for 1928. The contents are divided into 9 sections which are indexed so that all section titles are visible at a glance.

Power transmission is described in the first section featuring the extensive use of Timken bearings. Section 2 is devoted to the power facilities, including an account of the new 6 cylinder Hercules engine which is optional equipment for the 1928 pavers. Caterpillar traction is the subject of section 3, and in the next part the double cone drum is described. In section 5, which is devoted to the loading facilities and the raised center skip, a double page spread of photographs has been inserted. These photos show the paver in actual operation in the various parts of the country. The remaining sections detail other features, such as power loading derrick, boom, and bucket; banked lever control; automatic water tank, and batchmeter.

Among the last pages of dimension tables, charts, and other data, is a brief account of the fast transportation possible using the new one-man folding top and the Foote transport trailer.

NOTES FROM THE FIELD

Super Cement Representative

Mr. R. S. Ridge has become the Philadelphia representative of the *Lawrence Cement Company* in its marketing of *Dragon Super Cement* in the territory. His office is located in the Harrison Building, 15th and Chestnut Streets.

Mr. Ridge was previously interested in the California Stucco Products Company of Philadelphia.

Milwaukee Capital Organized

The National Equipment Corporation has been organized by Milwaukee, Wisconsin, financial interests for the purpose of purchasing and holding a controlling interest in several non-competing construction equipment companies in various parts of the country. The new corporation already holds an option for the purchase of a controlling interest in the *T. L. Smith Company,* a Milwaukee concrete mixer concern. It is generally understood that the option will be exercised sometime during January, 1928. Among those interested in the new holding company are *Harold E. Smith,* president of the *T. L. Smith Company, Philip Koehring, Joseph E. Uihlein, Robert Uihlein,* and various other Milwaukee financial interests whose identity has not yet been announced. It is the intention of the holding company to purchase the controlling interest in several other construction equipment concerns and negotiations are now in progress for the completion of several such deals.

The officers, directors and management of the *T. L. Smith Company* will continue as heretofore.

Harold E. Smith will continue as president and in active charge of the *T. L. Smith Company.*

Steel Magnate Dies

Edward L. Ryerson, chairman of the board of directors of Joseph T. Ryerson & Son Inc., died January 19, at Chicago.

The present officers of Joseph T. Ryerson & Son Inc., are: Joseph T. Ryerson, president; Donald M. Ryerson, vice president and general manager; Edward L. Ryerson, Jr., vice president; E. L. Hartig, vice president; and G. G. Moody, vice president.

Rope Warehouse

The American Cable Company has established a storage warehouse in Chicago carrying complete stocks of all sizes of *Tru-Lay* wire rope and *Tru-Lock* fittings.

Cordery Moves

The Cordery Cinder Products, Incorporated, has removed its offices to 1210 Prudential Building, Buffalo, New York. It was formerly located at Passaic, New Jersey.

Smith Representative

The T. L. Smith Company of Milwaukee, Wisconsin, manufacturers of concrete mixers and pavers, have appointed *James H. Smith* as field sales representative to agents. Mr. Smith was formerly located in the South for the Novo Engine Company and will now have his headquarters in Milwaukee.

Ryerson Service

In line with its policy of making quick shipment of steel, *Joseph T. Ryerson & Son Inc.,* recently, in filling an order received in the late afternoon by wire from Iowa City for rivets needed at once, delivered the rivets by airplane express from its plant 236 miles distant. After being completed in the plant the order was rushed to the American Railway Express and was at their air station in time to catch an airplane express. Over Iowa City the rivets were thrown out and put into use that night.

Absorbs Derrick Firm

The A. J. Kirstin Company, Escanaba, Michigan, has just completed arrangements whereby it has taken over the *Taylor Portable Steel Derrick Company* of Chicago, Ill.

The A. J. Kirstin Company is now in production on the *Taylor* portable steel derrick, which will be later named the *"Kirstin Steel Derrick."* A complete service is free to all interested, maintained for the solving of hoisting problems, etc.